Winter 2011

Environmental impact assessment of the Ruth Creek Hydroelectric Project

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Environmental Impact Assessment of:

THE RUTH CREEK HYDROELECTRIC PROJECT

Andrea Campbell - Darcie Williams - Paul Whelan - Daniel Skillman - Trevor Gearhart

Prepared for ESCI 436; Winter 2011
Conducted Under the Supervision of Dr. Leo Bodensteiner
Huxley College of the Environment - Western Washington University

This report represents a class project that was carried out by students of the Huxley College of the Environment, Western Washington University. It is purely for practice and has not been undertaken at the request of any person(s) representing local government or private individuals. Nor does it necessarily represent the opinion or positions of individuals from government or the private sector.

The Ruth Creek Hydroelectric Project EIA Team
Environmental Impact Assessment – ESCI 436
Huxley College of the Environment
Western Washington University
516 High Street
Bellingham, WA 98225

March 8th, 2011

To Whom It May Concern:

An application for a preliminary permit has been granted to the Massachusetts based Corporation, Free Flow Power, under *Clean River Power 12, LLC* by the Federal Energy Regulatory Commission (Project No. 13866-000) to evaluate the viability of a small-scale hydroelectric project on Ruth Creek, a tributary of the North Fork Nooksack River. The proposed site is located approximately thirteen miles east of Glacier, WA within Mount Baker-Snoqualmie National Forest. The following impact assessment addresses both the current condition of the proposed site location and predicts potential environmental impacts as a result of construction. Furthermore, we suggest a comparable alternative proposal to enhance the existing earth-fill dam on Cle Elum Lake, located near Roslyn, WA. This enhancement would add the capability to produce hydroelectric power on an existing structure already in use for flood mitigation and irrigation purposes.

Small-scale hydroelectric facilities offer an alternative to practices known to have adverse environmental impacts (coal fire plants, etc.), but concerning impacts can still arise. We address these concerns and potential mitigating efforts to reduce their impact on the landscape in hopes of realistically accounting for the societal need for electricity while considering the long and short term implications of dam construction. The following document attempts to encompass all elements of the environment that are at risk and objectively evaluate the severity of those concerns.

Sincerely,

Andrea Campbell, Darcie Williams, Paul Whelan, Daniel Skillman & Trevor Gearhart

FACT SHEET

Order issuing preliminary permit and granting priority to file license application by the Federal Energy and Regulatory Commission. January 31, 2011.

Clean River Power 12, LLC Project No. 13866-000

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Project Title: The Ruth Creek Hydroelectric Project

Project Description:

The Ruth Creek Hydroelectric Project proposes the development of a 2.5 MW hydropower facility on Ruth Creek, a tributary of the North Fork Nooksack River within Whatcom County, WA. The proposed project area encompasses 93 acres within Mount Baker-Snoqualmie National Forest and is approximately 13.5 miles NE of the town of Glacier, WA.

Coordinate location: Latitude: 48° 53’ 39.71” N
Longitude: 121° 39’ 08.35” W

Relevant Permits & Licensing:

Federal Permits & Licenses

- Federal Energy Regulatory Commission (FERC) Application
- Federal Power Act (circa 1920, amended through 1995)
- DHAC – Division of Hydropower Administration & Compliance

Relevant Laws:

Federal Laws

- Federal Power Act
- Public Utility Regulatory Policies Act
- Electric Consumers Protection Act of 2005
- Energy Policy Act of 2005
- Endangered Species Act of 1973
- Federal Water Pollution Control Act (2002)
- Clean Water Act (1972)
- Coastal Zoning Management of 1972
- National Environmental Policy Act
- National Historic Preservation Act
- National Dam Safety Program Act

Washington State Laws

- US Department of Agriculture's Forest Service Land & Resources Management
- State Environmental Policy Act (RCW 43.21C & WAC 197-11-010-968)
- Shoreline Management Permit (RCW 90.58, WAC 173-14)
- Washington State Department of Ecology
- Washington State Department of Natural Resources
- Washington State Department of Wildlife (RCW 75-20-100)
- Washington Office of Archeological and Historic Preservation (CFR 36 part 800)
- Critical Areas (WCC Title 16.16)
- Watersheds Admin (WCC Title 20)

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Acknowledgments:

We would like to thank the following people for their assistance on this project:

Dr. Leo Bodensteiner, Environmental Impact Assessment Advisor, WWU
Stefan Freelan, GIS Specialist, WWU
Jason Hines, Free Flow Power Corporation, Massachusetts
Rich Bowers, Hydropower Reform Coalition, Washington
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Distribution List:

Digital Collection, Huxley Map Library
Digital Collection, Wilson Library

Issued:

March 8th, 2011

Public Presentation:

Tuesday, March 8th, 2011 at 2:00PM in Woods Coffee, Boulevard Park location, Bellingham, WA.

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EXECUTIVE SUMMARY

The ensuing document presents the potential environmental impacts from a proposal submitted by the Free Flow Power Corporation of Massachusetts to the Federal Energy and Regulatory Commission for the development of a small-scale hydroelectric project on Ruth Creek, WA. Upon evaluating the existing conditions and likely effects of the proposed actions, we present an alternative solution of comparable cost and power generation; an enhancement of the earth-fill dam already in place on Cle Elum Reservoir, near of Roslyn, WA.

Located in Whatcom County within Mount Baker-Snoqualmie National Forest, the Ruth Creek tributary meanders from alpine settings at its glacial headwaters to the North Fork Nooksack River, a distance less than 10 miles from Ruth Glacier. The 93 acre proposal stipulates the placement of a 100ft long, run-of-the-river, ogee mid-stream weir to partially divert flow to an impounded pond where an intake structure would reside, equipped with a trash rack, fish screen and closure gate. The impounded pond is expected to be relatively small, having a surface area of 0.10 acres and volume of 0.4 acre-feet. Upon entering the intake, water will travel down a ~8000ft long, 42” diameter steel penstock with both above and below ground sections. The water then reaches the powerhouse complex where it spins turbines before returning to the creek via a 20ft long, 6x6ft concrete culvert followed by a 20ft long, 12ft wide lined rip rap tailrace that will blend with the creek bank. The resultant power generation capacity is expected to be 2.5MW, with an estimated average annual energy production of 10GWh. The power generated will travel across the proposed 55kVA transmission lines, which are expected to be ~2.2 miles long and will connect to the local utility grid. Approximately 500ft of new access roads will need to be constructed to connect both the powerhouse complex and intake/weir structures to NF Develop Road 32. Environmental concerns based on both the location and lack of development in the surrounding area are discussed further in the body of this document.

Based on the expressed purpose of the aforementioned proposal to generate electricity, we also present an alternative to acquiring the power output desired from the Ruth Creek proposal; The Cle Elum Hydroelectric Project. Also applied for by Free Flow Power, this proposal is located in a starkly different geographic landscape in Kittitas County, just north of Interstate 90, WA. The Cle Elum Reservoir is held in place by a 165ft tall earth-fill dam, owned and operated by the US Bureau of Reclamation since 1933 to mitigate flood events, provide irrigation to local farms and pastures, offer recreational activities, and serve fish and wildlife purposes.

The alternative proposal suggests enhancing the existing dam to also produce hydroelectric power. This venture would be accomplished by constructing a spillway, ~1,000ft long penstock, 7,000sqft powerhouse and a 15MVa

substation. The project encompasses less than 6 acres of land and is expected to generate 18.0MW of power. Concerning environmental impacts from this proposal are discussed further in the body of this document and surmised in the conclusion.

The intent and purpose of this impact assessment is to evaluate the severity and scope of potentially adverse effects on the environment due to the proposed construction. These elements were thoroughly examined in an objective manner to ensure fair assessment of both the proposed action and suggested alternative under the Washington State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA). The sections presented hereafter describe in detail the elements of the environment that pertain to small-scale hydroelectric projects; the light & glare and housing elements were omitted due to their irrelevance to these proposals. After interpreting our results and quantifying likely impacts, we conclude that the alternative presented would likely produce fewer and less severe adverse effects on the surrounding environment than the proposed action; the proposed alternative is, therefore, our recommendation.

GLOSSARY, ACRONYMS & ABBREVIATIONS

Acre feet ……Measure of volume equivalent to one acre of surface area to a depth of one foot (1 acre foot = 43,560 cubic feet or 325,851 gallons)
Allochthonous…….Derived from outside a system, such as leaves of terrestrial plants that fall into a stream.†
Anadromous……Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon, steelhead, and shad are examples.†
BMP……Best Management Practices
DHAC…….Division of Hydropower Administration and Compliance
FERC……..Federal Energy and Regulatory Commission
Greenhouse gas……Chemical compounds in the atmosphere that trap heat. They retain a proportion of the sun's heat through a mechanism known as the greenhouse effect.
GWh……...Giga Watt Hours
kVA……Kilo Volt Amperes
NF……...National Forest
MBSNF……..Mount Baker-Snoqualmie National Forest
MW……Mega Watts
Ogee……...A molding consisting of a continuous double curve, S-shaped in cross-section, and usually with the upper part convex and the lower part concave; a cyma reverse.*
Penstock…….A channel, trough, or tube for conveying water from a lake, dam, etc., especially to a waterwheel or turbine.*
Powerhouse……A building in which power is produced on a large scale for driving machinery or for generating electricity for distribution; a power station, a power plant.*
PUD……....Public Utilities Department
Riparian……...Living or growing on the banks of rivers and streams; relating to or characteristic of the transitional zone between dry land and running water. †
Small-scale Hydro…..The Department of Energy defines small hydropower as facilities that have a capacity of 100 kilowatts or 30 megawatts.
Weir…….A barrier or dam to restrain water, especially one placed across a river or canal in order to raise or divert the water for driving a mill-wheel; also, the body of water retained by this means.*
WDFW……Washington Department of Fish & Wildlife

† Definition from Merriam-Webster Online Dictionary
*** Definition from Oxford English Dictionary Online**

ENVIRONMENTAL IMPACT MATRIX

S = Possible Significant Impact; NS = Impact Determined to be Non-Significant

Natural Environment	*Proposed Action*	*Proposed Alternative*
EARTH		
Geology	NS	NS
Soils	S	NS
Topography	NS	NS
Erosion	S	NS
AIR		
Air quality	NS	NS
Odor	NS	NS
Climate	NS	NS
WATER		
Surface water	S	S
Runoff/absorption	NS	NS
Floods	NS	NS
Groundwater	NS	NS
Public Water Supply	NS	NS
PLANTS & ANIMALS		
Diversity of Plant Species	S	S
Habitat for Plant Species	S	S
Habitat for Animal Species	S	NS
Diversity of Animal Species	NS	NS
Unique Species	NS	NS
Fish and Wildlife Migration Routes	NS	NS
ENERGY & NATURAL RESOURCES		
Energy Requirements	NS	NS
Source and Availability	NS	NS
Conservation and Renewable Resources	NS	NS

Built Environment	*Proposed Action*	*Proposed Alternative*
ENVIRONMENTAL HEALTH		
Noise	NS	NS
Risk of Explosion	NS	NS
Release of Toxins or Hazards to the Environment	NS	NS
LAND & SHORELINE USE		
Existing Land Use Plans	NS	NS
Housing	NS	NS
Light and glare	NS	NS
Aesthetics	NS	NS
Recreation	S	NS
Historic and Cultural Preservation	NS	NS
Agricultural Crops	NS	NS
TRANSPORTATION		
Transportation Systems	NS	NS
Vehicular Traffic	NS	NS
Parking	NS	NS
Movement of People and Goods	NS	NS
Traffic Hazards	NS	NS
PUBLIC SERVICES & UTILITIES		
Fire	NS	NS
Police	NS	NS
Schools	NS	NS
Parks and Recreational Facilities	NS	NS
Maintenance	NS	NS
Communications	NS	NS
Storm Water	NS	NS
Sewer/Solid Waste	NS	NS

PROPOSED FEATURES OF
The Ruth Creek Hydroelectric Project

Cartography by Paul Whelan - For use in Environmental Impact Assessment of Proposal - ESCI436 - March 4, 2011

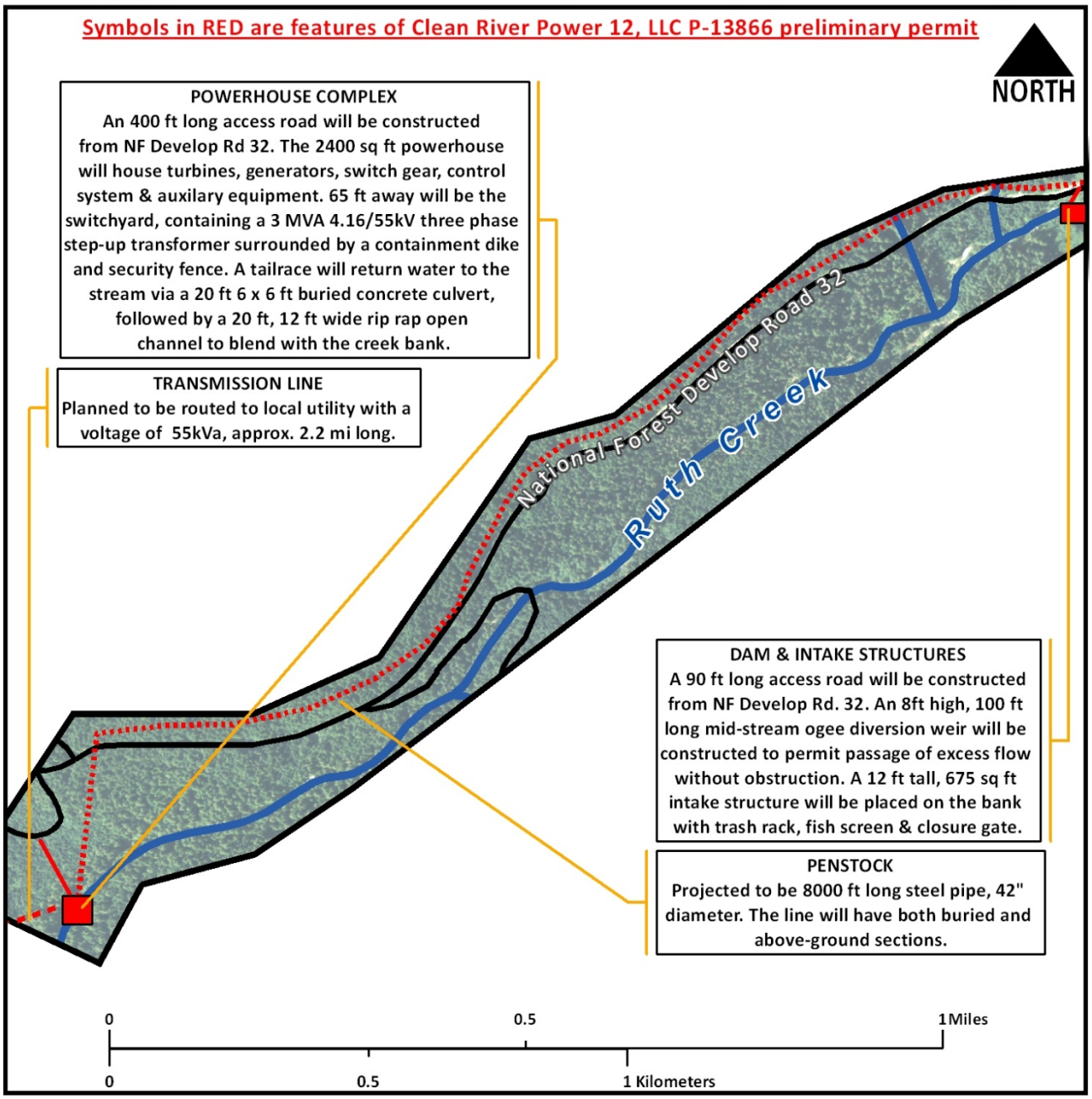
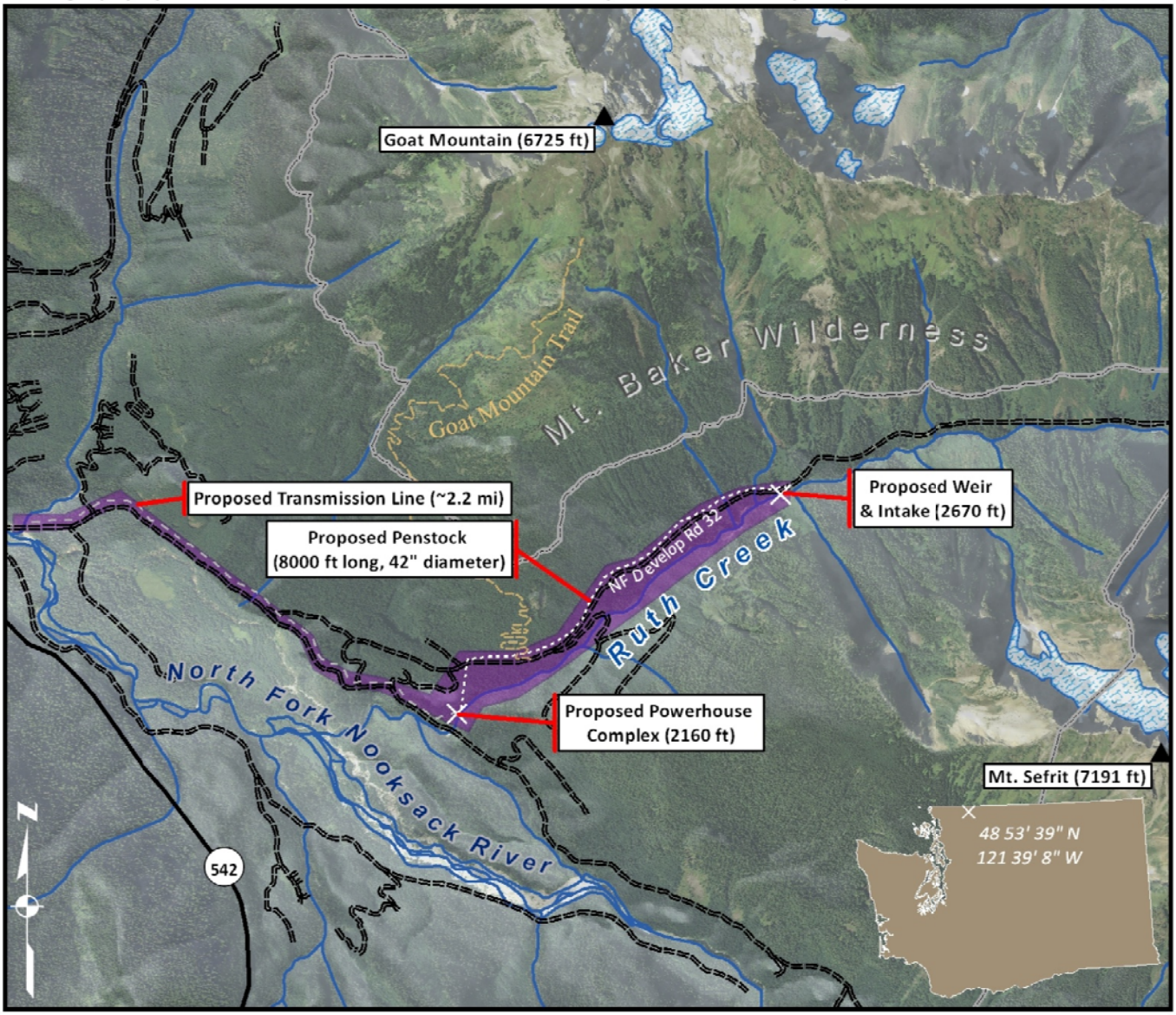


TABLE OF CONTENTS

EIA PROPOSED ACTION:
Ruth Creek Hydroelectric Project

Cartography by Paul Whelan - For use in Environmental Impact Assessment of Proposal - ESCI436 - March 4, 2011



LEGEND

- Proposed Structures Sites
- Transmission Line
- Penstock
- 93 Acre Project Boundary
- Glaciers
- Mountain Peaks
- SR 542
- USFS Roads
- Streams & Rivers
- Wilderness Boundary
- Trails

Proposed project area and the included features were constructed based on visual analysis and interpolation of the map presented in Free Flow Power's permit submission to the Federal Energy Regulatory Commission. All other data are courtesy of Western Washington University's Spatial Analysis Institute.

0 0.5 1 Miles

0 0.5 1 Kilometers

NAD 1927 UTM Zone 10 Projection

PROPOSED ACTION:

Introduction to the Ruth Creek Hydroelectric Project

This environmental analysis focuses on a 93-acre parcel in the Ruth Creek watershed, located in between Goat Mountain and Mt. Sefrit and continuing into the North Fork Nooksack River floodplain. This area falls within the Mount Baker-Snoqualmie National Forest. The vegetation in the immediate area is made up of several old growth stands, late & early successional stands and riparian vegetation. The creek is a 2nd- 3rd order stream which is glacially fed from Ruth Glacier in addition to the surrounding streams. As an alpine stream, Ruth creek relies heavily on allochthonous inputs for nutrients and energy. Ruth creek has one species of native trout, cutthroat, and two introduced species, brook and rainbow trout (Oncoryhnchus clarki clarki, Salvelinus fontinalis, & Oncoryhnchus Mykiss; respectively). Additionally, there are also numerous other species of primary consumers within the stream, as well as terrestrial species in surrounding landscape (See Appendix IV). This area is also used for recreation with hiking trails in the vicinity, and the creek itself is used by whitewater kayakers & rafters as well as recreational fishers.

The proposed action studied in this report consists of a small-scale hydro-electric system which would be installed on the lower reaches of Ruth creek. This project would generate 2.5 MW of power and will consist of a 100 ft. diversion weir which will impound 0.4 acre-feet of water and feed into an 8000 ft. penstock. This 42" diameter steel conduit would be linked to a powerhouse complex, and finally return the extracted water to the creek via a tailrace. This project will also require the installation of 2.2 miles of above-ground power lines and approximately 500 feet of new access roads.

1) EARTH

1.1 Existing Earth Conditions:

The proposed action location resides in two different geographic landscapes. A majority of the project area sits between two peaks (Goat Mountain 6725ft & Mt. Sefrit 7191ft) in the Ruth Creek valley, while an extension of the boundary follows the North Fork Nooksack River flood plain. Within the proposed project area there are five soil types identified by MBSNF. A majority of this project area lays on a stable sandy loam with rapid to variable permeability. In the upper reaches of Ruth Creek, where the intake and weir would reside, the soil type is a stable to unstable gravel and boulder loam with variable permeability. The proposed penstock will be constructed on both the aforementioned sandy loam and a stable to unstable gravelly loam with variable

permeability. The proposed transmission line will run across both the sandy and gravelly loam in addition to a stable gravelly silt loam with rapid permeability and a stable loam with rapid permeability (MBSNF, 2011). See Appendix IX for a map of soil distributions. Slope steepness within the project area is minimal, with steeper grades only in the upper reaches (approximately 80% steepness at most). A majority of the area will likely only encounter grades of 20-30^0 (~40-60% slope) or less.

1.2 Proposed Action Impacts to Earth Characteristics:

Given the soil structure, slope condition and estimated footprint of the proposed augmentation to the landscape, some environmental concerns arise. There is no historical evidence that a high risk of landslide and sloughing exists in the vicinity, nor are there many surface indicators that such adverse impacts may result from construction. However, the classification of soils in the upper reaches of the project area as unstable to very unstable does warrant some level of concern. Coupled with the removal of native vegetation to accommodate the proposed structures, there exists a risk of siltation and sedimentation to Ruth Creek as a result of sloughing soil. It has been noted that removed vegetation causes deterioration of root systems, decreasing soil strength and structure. It is recommended that care be taken to mitigate this risk of erosion, especially ensuring that placement of the penstock is such that the riparian corridor is as unaffected as possible.

2) AIR

2.1 Existing Air Conditions:

The air quality at the site is near pristine with little industrial action taking place within fifty miles of the location. Any contaminates that are entering the area are likely transported there via prevailing winds, carried from metropolitan or industrial areas. If no action is to take place, the air quality at this location will remain stable.

2.2 Proposed Action Impacts:

Air Quality: Based on the nature of the project there likely will not be any significant impacts on air quality. There is a possibility that during construction, exhaust emission from construction equipment & vehicles could impact local air quality; those impacts would be brief and will not sustain past completion of the project.

Odor: There will likely be no significant odor, aside from exhaust, created from this project as no sewage or waste treatment is expected to occur on site.

Climate: There will be a slight increase in airborne carbon dioxide levels, in addition to other transportation and construction related emissions during the period of construction. However, this phase should not last for more than a few months. These gases, despite their brief residence, will contribute to the buildup of greenhouse gases. It is worth noting that these effects will be countered by the emissions-free energy generated from the dam. This project is slated to produce around 10 GWT of energy every year, which if produced by an oil or coal fired power plant would produce between 8500 to 9900 t CO_2 (Bratrich et al 2004). Due to these differences in CO_2 emissions, there is no significant environmental impact on the climate from air pollution.

3) WATER

3.1 Existing Water Conditions:

Ruth Creek is a sub-alpine creek with headwaters at Ruth Glacier and serves as a tributary to the North Fork Nooksack River. This stream is in near pristine condition, with no development within the watershed save a Forest Service road and abandoned silver mine. Furthermore, there has been very limited logging within the watershed over the last one hundred years. This stream has uninterrupted flow throughout the summer and peak flows in the spring resulting from snowmelt. Water quality for this stream is currently unknown, though it is reasonable to assume that it has a high level of dissolved oxygen due to its elevation, surface roughness and shading from the surrounding vegetation resulting in cool temperatures. Most streams in the Pacific Northwest have low levels of water hardness, though all of these parameters will vary from stream to stream. It is recommended that a baseline analysis of Ruth Creek water parameters be conducted before any alterations take place.

3.2 Proposed Action Impacts:

Surface Water Movement/Quantity/Quality: This project has the possibility to significantly impact surface water movement, quality and quantity throughout different segments of Ruth Creek. The diversion weir will impact water flows by creating a new obstacle to the active channel, contributing to surface roughness and impacts due to pooling along the weir. This could lead to increased sediment deposition against the weir, potentially causing deficient sediment and nutrient availability downstream (Anselmetti et. al., 2007). The implementation of the diversion weir may also lead to a change in stream bed morphology as the weir would alter the channel, possibly leading to erosion on the opposite bank. There will be a decrease in available water to the stream between the diversion weir and tailrace, possibly affecting local fish movement as well as aquatic

and riparian flora and fauna (Meier et. al., 2003). Reduction in stream discharge below the weir, along with a decrease in riparian cover in the area will likely cause an increase in temperatures along the stretch of stream between the weir and the tailrace (Poole and Berman, 2001). There is little likelihood that the water returning to the stream from the powerhouse will have any significant impact on the stream as the rip rap is designed to blend with the existing bank, however it would create a confluence that may alter the local substrate and could, therefore, have a localized impact on the creek's biotic composition.

Runoff: There will likely be impacts on the stream during construction and afterward due to an increase in impermeable surfaces along the river. Though difficult to quantify, these additional surfaces may lead to increased runoff and stream flow as water enters the stream at higher rates after precipitation events (Lawrence, 2001).

Floods: The proposed action's partial impoundment of Ruth Creek may increase the potential for flooding in the upper reaches of the project area near the diversion weir. High flows could lead to excess water being diverted to the stilling pond and inundating the surrounding banks. The proposal outlines the use of an overflow break in the weir to accommodate peak-flow conditions; although, depending on the severity of the flood, it may not be effective at mitigating this potential impact. Furthermore, there may also be decreased minor flood events in the stretch between penstock and tailrace due to reduced volume. This can have effects on nutrient and sediment exchange between the stream channel and the riparian zones (Gurnell, 1983).

Groundwater Movement/Quantity/Quality: Construction of foundations for the powerhouse complex, the weir & intake structures, and penstock could possibly have impacts on the flow of groundwater. Interactions between groundwater and surface water are highly complex and dependent upon various aspects of both the stream and the substrate, making predictions inherently uncertain. In order to completely understand the impacts the proposed action would have on groundwater, it is recommended that an extensive survey be completed.

Public Water Supplies: There are no foreseeable impacts on public water supplies from this project. The dam will be a run of the river, causing little to no impact on the quantity of water eventually reaching the North Fork Nooksack River.

4) VEGETATION

4.1 Existing Vegetation Conditions:

The proposed project area resides within Mount Baker National Forest, which encompasses old growth, secondary growth and riparian vegetation. Furthermore, the site lies west of the North Fork Nooksack Natural Research Area which contains 1400 acres of old growth forest. Within the project vicinity, MBSNF has identified several historic tree stands; two stands in particular are of notable interest as they date back to 1308 and 1701 (see Appendix X, Map of Local Tree Stands). The region is mostly covered by coniferous forest, various shrubs and grass species. The area does contain some mixed forest as well, as deciduous species can be found growing in open areas of the forest. According to the Washington State Department of Natural Resources, the most abundant tree species surrounding the creek are Douglas fir, Western hemlock, Western red cedar and Pacific silver fir. The area of interest also contains an understory full of ferns, lichen, moss, fungi, shrubs and grass species; growing both on the forest floor as well as on trees, logs and rocks, they provide habitat and shelter for animals and insects. Vegetation within the riparian corridor, which consists of rushes and sedges, is significantly important for the ability to stabilize stream banks, filter sediments and provide food and habitat for animals. *Refer to Appendix II for a full list of plant species in and around Ruth Creek in Whatcom County, WA.*

4.2 Proposed Action Impacts to Vegetation:

Construction of the proposed structures will cause a significant amount of disruption to the forest and vegetation of the surrounding area. In order to accommodate these features, extensive clearing of timber and riparian vegetation will be required for placement of ~500ft of access roads, 2.2 miles of transmission line, ~8,000ft of penstock, 2400sq ft. powerhouse complex and substation facility. By removing native vegetation, deficient root systems will cause soils to become unstable, increasing the probability of landslides.

Furthermore, vegetation removal can potentially increase (Knutson, K. L, et al):

- Storm water runoff and flooding frequency, causing increased levels of sediment and nutrients in Ruth Creek;
- Stream turbidity, which can reduce the light and oxygen necessary for plant and animal life;
- Volume and velocity of stream flows which can scour stream beds as well as decrease stream habitat function and diversity;
- Stream temperatures, and, as a result, reduce dissolved oxygen levels.

Although a percentage of the removed vegetation will likely grow back, animal species dependent on these plants may be impacted due to the lack of habitat needed for survival during this interim period. To lessen the

impact on vegetation, necessary mitigation measures should be enforced and regulated. Such mitigation should include replanting native species as well as efficient land use planning and design to minimize the amount of vegetation removed. It is also recommended that care should be taken to insure non-native and invasive species are not introduced during construction from vehicles, machinery, and personnel travelling in and out of the area. This could be accomplished by implementing a comprehensive plan to clean vehicles and machinery before they arrive on site.

5) UTILITIES

5.1 Existing Utility Conditions:

There presently are no utilities available at the proposed site

5.2 Proposed Action Impact on Utilities:

The project would not require installation of any utilities for routine maintenance or any other purpose. Transmission lines are proposed for 2.2 miles following the existing Forest Service Rd 32 to relay electricity from the switchyard to existing local utilities (Preliminary Permit Issuance, Appendix VII). Installation of the power lines would require the use of construction equipment and the removal of vegetation impacting not only the noise levels, but the risk of erosion which could lead to increased levels of sediment deposition into Ruth Creek if not properly mitigated.

6) ANIMALS

6.1 Existing Animal Conditions:

Fish Species: The upper stretches of the North Fork Nooksack River is home to three identified trout species: rainbow trout, cutthroat trout and brook trout; although, cutthroat trout is the only species native to this area. Ruth Creek serves as a tributary to the North Fork Nooksack River, which is a known habitat for salmonid species (see Appendix VI). Non-native rainbow trout and brook trout species were stocked into nearby alpine lakes and have likely found their way into Ruth Creek over time. Attributes and characteristics of the three local fish species are:

Rainbow Trout – The rainbow trout of Ruth Creek are not a native species. This species has been stocked into nearby alpine lakes of the area and have most likely found their way into Ruth Creek. The rainbow trout of Ruth Creek are resident form instead of anadromous, meaning they do not migrate to sea.

Brook Trout – The brook trout of Ruth Creek are also a nonnative species. These fish have escaped from downstream stockings of alpine lakes and now spawn in Ruth Creek using any available habitat.

Cutthroat Trout – The cutthroat trout of Ruth Creek are the only native fish species, and are found in many small alpine streams throughout the Cascades. In Ruth Creek, cutthroat trout are of resident form and use the available habitat to spawn. Cutthroat trout reside in low gradient streams with temperature ranges of 9-12 degrees Celsius.

Other Animal Species: The North Fork Nooksack River basin provides high-quality habitat for a variety of native wildlife species. These diverse animal communities use the riparian vegetation throughout the watershed for essential life activities. Such species who utilize the area include bear, elk, deer, small mammals, reptiles, amphibians, cavity-nesting birds and raptors (WDFW, 2011). *Refer to Appendix IV& V for a full list of existing and rare fish and wildlife species in and around Ruth Creek in Whatcom County, WA.*

6.2 Proposed Action Impact on Animals:

Fish Species: The most noteworthy impact from the proposed action on fish species would likely be the alteration of localized stream temperatures. The installation of the proposed dam may alter water temperature from the preferential range for Cutthroat trout of 9-12 degrees Celsius. Temperature may also be affected/ increased due to the removal of trees and other native vegetation within the riparian corridor for construction of the project features, causing deficient stream shading. Furthermore, decreased flow velocity may also cause resultant declines in dissolved oxygen levels and unnatural sediment budgets. These conditions may alter the stream composition and adversely affect the natural habitat of the local fish species. It is recommended that care be taken to adjust flow rates during warm weather and low flow conditions such that water returning to the stream via the proposed tailrace does not warm nearby pools of cool water as this can result in thermal shock.

Other Animal Species: The proposed project will likely have no significant impacts on animals of the area. Although a security fence will surround the substation and the penstock will have above-ground sections, no significant impact to animal movement and migration is likely. However, construction of this project could have a negative impact on animal habitat availability as removal of riparian vegetation may directly affect the

habitat of local terrestrial species. Noise produced by this project is a slight concern and could interfere with wildlife of the area. Although no endangered species have been specifically documented in this area, animals such as the northern spotted owl, Oregon silverspot butterfly, and the bald eagle are examples of threatened and/or endangered species that could be found near Ruth Creek.

7) ENERGY & NATURAL RESOURCES

7.1 Existing Conditions:

Currently, no energy sources exist within the project area. As stipulated by the proposal, the transmission line will meet with existing local utilities approximately 2.2 miles from the substation and powerhouse complex.

7.2 Proposed Action Impacts:

The design of the proposed small-scale hydroelectric system uses the stream's flow and gravity to rotate the turbine blades; any auxiliary equipment found in the powerhouse would utilize minimal amounts of energy. During construction, gasoline will be used to power machinery, vehicles and equipment. No adjacent properties use solar energy, nor would the project affect their use if they existed. No energy conservation features or measures to reduce energy impacts are included in the proposal due to the relatively 'clean' natural of hydroelectric production and preliminary status of the FERC application.

8) ENVIRONMENTAL HEALTH

8.1 Existing Environmental Conditions:

The current environmental state of the proposed project area is relatively pristine, though some forestry practices have occurred. In regards to environmental health hazards, there are no significant threats or risks of noise, chemical spills, environmental pollution, and/or explosion.

8.2 Proposed Action Impacts on Environmental Health:

Based on the features of the proposed project, higher noise levels than normal conditions are expected during the construction period. Noise will mainly be due to machinery and equipment such as excavation, material hauling and vegetation clearing. However, the increase in noise will only be temporary, localized and limited to

daytime hours. Though minimal, the presence of the equipment and machinery needed for construction poses a risk of possible chemical spills (diesel, gasoline, and oil), explosions and hazardous waste contamination. So long as due diligence is exercised to prevent such environmental health hazards, the risks mentioned above do not present a significant impact.

9) LAND & SHORELINE USE

9.1 Existing Conditions:

The proposed project area resides completely within Mount Baker-Snoqualmie National Forest, under the jurisdiction of the US Department of Agriculture for forestry use.

9.2 Proposed Action Impacts:

All of the facilities for this project occupy federally owned and managed land. The Division of Hydropower Administration and Compliance has jurisdiction for insuring compliant land and shoreline use in consideration of both the Federal Power Act (Appendix VIII) and related agency procedures including but not limited to: Department of Natural Resources, US Forest Service and Washington State Department of Ecology (DHAC, 2004).

10) AESTHETICS

10.1 Existing Aesthetic Conditions:

The current aesthetic value of the project area is relatively high, offering unobstructed views of scenic forest landscapes. Aside from an abandoned mine outside the project vicinity, there are no man-made structures in the immediate area. Although the project site is not within Mount Baker Wilderness, the area contains only logging roads and is mostly devoid of human impact.

10.2 Proposed Action Impacts:

It is difficult to address aesthetic impacts on the landscape resulting from the project due to the incomplete description of many features of the proposal. The estimated dimensions of the diversion weir and intake pose no significant impacts. The penstock will likely pose little aesthetic impact as it parallels the existing USFS road and should not cross the local recreational trail to Goat Mountain. The powerhouse facility exhibits the highest

likelihood of producing adverse aesthetic impacts on this location. Upon review of the equipment the powerhouse will contain, the switchyard located 65 feet away and the security fence that will encompass both structures, this complex presents a possible significant impact to the preexisting aesthetic value. The proposed 90ft long access road to the complex may not serve as an adequate buffer to mitigate these effects, but further encroachment on the riparian corridor may produce a more significant impact on the landscape. Regarding all the proposed features, the project poses little to no significant impact on aesthetics; however, further research is recommended to determine the ideal location of the powerhouse/switchyard complex as it presents the greatest potential impact.

11) RECREATION

11.1 Existing Recreation Conditions:

Currently there are a handful of uses for backcountry enthusiasts to enjoy in the project vicinity. The trailhead for the Goat Mountain Trail is located on NF Develop Road 32, the same road to be utilized by construction crews. Ruth Creek also supports a white water rafting/kayaking and fly fishing constituency due to its remote location and uninterrupted flow.

11.2 Proposed Action Impacts on Recreation:

Hiking, fishing, and white water rafting enthusiasts may all be significantly affected by the proposal. With the installment of this project, noise along with loss of scenery may hinder the natural hiking experience. The proposed project has a possibility of decreasing the fishing environment by adversely affecting habitat and potentially decreasing local fish populations. Avid white water rafting enthusiasts would be greatly affected by the installment of this project as well. This project has the potential to decrease water flow, increase pooled and still water, and alter the configuration of the stream; these changes may cause negative impacts on recreational uses. While the Goat Mountain Trail will likely be unaffected, the increased construction traffic on NF Develop Road 32 may hinder hiking experiences in the short-term.

12) HISTORIC & CULTURAL PRESERVATION

While the Nooksack watershed, where Ruth Creek is located, was once inhabited by tribes of the Lummi Nation, there is no available documentation to suggest that the area is historically or culturally sensitive.

13) TRANSPORTATION

13.1 Existing Transportation Conditions:

The site for the proposed project is located Northeast of the Mount Baker Highway (SR 542) and is accessed using National Forest Develop Road 32 (gravel). This road is not serviced by any other forms of transportation.

13.2 Proposed Action Impacts:

The proposed project will utilize NF Develop Road 32; however, two new access roads will need to be constructed. The upper road, accessing the intake and weir structures, will be 400ft long; the lower road, accessing the powerhouse and switchyard, is proposed to be 90ft long. The construction of these new roads will require grading and filling, presenting an uncertain degree of environmental impact and erosion risk. It is recommended that care be taken to ensure roads are built without significantly increasing the risk of erosion and subsequent sedimentation of Ruth Creek. It is assumed the construction of ~2.2 miles of proposed transmission lines, connecting the substation to local utilities, will follow the existing Forest Service road.

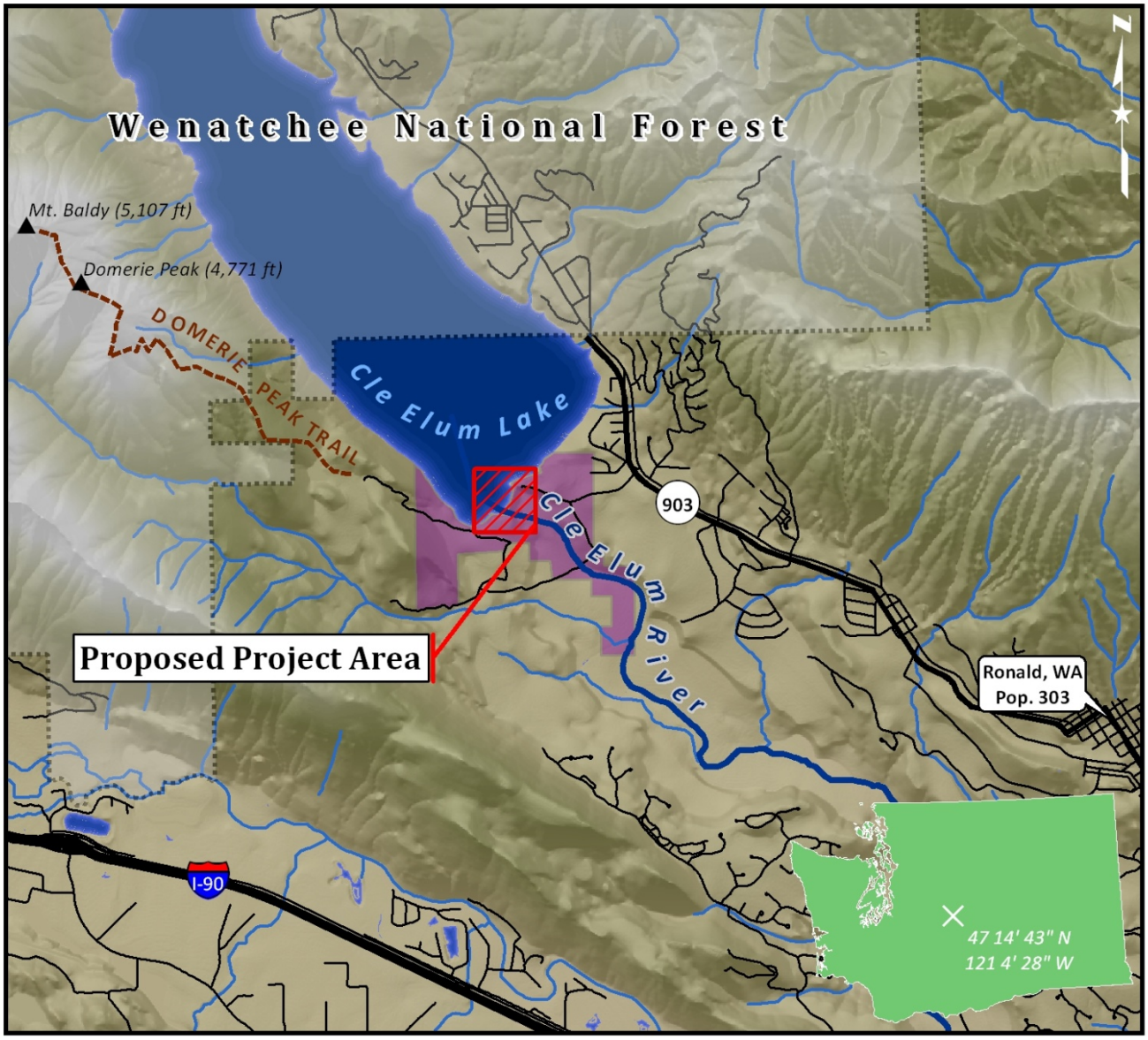
During the construction phase, a temporary increase in traffic is anticipated to facilitate the placement and use of machinery and equipment. Once completed, travel for regular maintenance will be required, but poses little impact in comparison to the construction phase. Public access to the construction site and staging areas may be restricted to personnel only, causing further impact. Furthermore, standard safety measures such as reduced speed limits and proper signage would be required for roads that access the construction site. The contractor will be required to maintain existing and future roads during both the construction phase and after completion of the project; possible dust regulations may need to be enforced. The proposed action likely will not present long term effects so long as a comprehensive erosion and pollution plan is implemented to prevent and/or reduce any unforeseen impacts that result from the construction phase.

14) PUBLIC SERVICES

Currently no public services are available in the project vicinity; the proposal does not suggest a need or significant impact to any public services.

EIA ALTERNATIVE PROPOSAL:
The Cle Elum Hydroelectric Project

Cartography by Paul Whelan - For use in Environmental Impact Assessment of Ruth Creek Hydroelectric Project - ESCI436 - 3/4/11



Proposal Features

-Enhancement of the existing Cle Elum Dam
-18.0 MW Powerhouse Complex
-Added Spillway, Penstock, & Substation

LEGEND

- Mountain Peaks
- Trails
- USFS Boundary
- Streams & Rivers
- State Land
- Roads & Highways

Project area was determined by visual analysis and interpolation of Free Flow Power's permit submission to the Federal Energy Regulatory Commission (FERC). Kittitas County provided the road data and Wenatchee National Forest provided the USFS boundary and stream data. All other data layers were either built or are courtesy of Western Washington University's Spatial Analysis Institute.

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

ALTERNATIVE PROPOSAL:

Introduction to the Cle Elum Hydroelectric Project

The proposed alternative to this project is to retrofit the Cle Elum dam, which is located just south of the Okanagan-Wenatchee National forest, with the ability to generate hydroelectric power. This dam is currently used for flood control and is part of a 5-reservoir system used to control water levels and provide irrigation to the surrounding area. The US Bureau of Reclamation owns the dam and surrounding land. The Cle Elum Dam holds a reservoir with a capacity of 436,900 acre-feet. The surrounding area consists of forests, grasslands, and recreational areas for camping and boating. The proposed alternative would require the addition of an intake, penstock, and powerhouse complex above the dam, with water returning to the Cle Elum River via the proposed tailrace. The US Department of Energy has already conducted surveys of the dam and believes that from a purely economic and functionality standpoint, a hydroelectric dam at this location is highly feasible. However, this hydroelectric venture would be required to share resources with the prior functions of the dam and, as a result, may diminish levels of productivity in order to maintain these functions. Producing an estimated 18.0MW of hydroelectric power, this proposal presents a viable alternative to the Ruth Creek Proposal.

15) Alternative Impacts: EARTH

The alternative proposal to enhance the existing dam on Cle Elum Reservoir to produce hydroelectric power presents few significant environmental impacts to the immediate and surrounding area. The US Department of Agriculture's Natural Resource Conservation Service classifies the soils in the project vicinity as a racker ashy sandy loam that is moderately permeable and has parent material from glacial outwash and volcanic ash. Additionally, the slopes within the project area suggest no significant environmental concern relating to erosion, sedimentation, or sloughing of material into nearby water ways (0-5% slope). The existing earth-fill dam was established in 1933 (US Department of the Interior, Bureau of Reclamation) suggesting that the surrounding geographic area has acclimatized to its presence, making an addition such as the proposed alternative of negligible impact. Furthermore, grading and filling for construction purposes are unlikely to affect the current condition of the area; expansion of impervious surfaces is also determined to be insignificant. The alternative proposal does not stipulate any mitigation efforts to reduce or control erosion as they are likely unnecessary. Overall, the added spillway, penstock, powerhouse, and substation to the existing 165ft high dam present few potential impacts to the environmental condition of local earth characteristics.

16) Alternative Impacts: AIR

Air Quality: Air quality will only be affected during construction of the project and will be relatively minor. There will be increased dust in the area due to construction and loosened soil, however, the impact will quickly dissipate once construction ceases. This could be partially mitigated by spraying the roads and construction areas with water or laying straw on the surface to decrease amounts of airborne dust and soil loss.

Odor: There should be no significant odor created by this project. There will be increased exhaust during construction, however this will be short term and relatively minimal; no significant impact on the surrounding area is expected.

Climate: Effects on climatic conditions will be minimal and will likely be very similar to the ramifications stated for the proposed action on Ruth Creek (See section 2.2).

17) Alternative Impacts: WATER

Surface Water Movement/Quantity/Quality: There will likely be no significant long-term impact on water quality in the area; during construction BMP will need to be implemented in order to mitigate possible stream siltation. There is a possibility that if the intake structure is not designed effectively it will alter the water quality by drawing water from stratified sections of the reservoir. These sections would have different levels of dissolved oxygen and would have effects downstream (Railsback et al. 1991). Immediately following construction, loosened soil could erode during rainfall; however, once the area is leveled, it will likely stabilize and return to preexisting conditions. Water movement and quantity likely will not be affected. Operation of the hydroelectric system will need to coordinate with water demands that are already in place relating to irrigation, drinking water supply and fisheries management. This project should be able to cooperate with these other uses and will rely on the fact that the Cle Elum Reservoir works with 4 other reservoirs to fulfill these needs; a balance of these functions is ascertainable (Bureau of Reclamation, 2009).

Runoff: There will likely be impacts to the Cle Elum River during the period of construction and afterward due to an increase in impermeable surfaces along the side of the river. This impact is expected to be should be short term.

Floods: There will be no significant impact on flooding; the dam is preexisting and is already used to mitigate flooding in the area.

Groundwater Movement/Quantity/Quality: There should be no significant impact on groundwater in the area. However, further studies of the local area would be required to ensure that the placement of the structures does not produce adverse effects.

18) Alternative Impacts: VEGETATION

Adding a hydroelectric power facility on a preexisting dam will have minimal impact on the vegetation that lies within the vicinity. However, depending on the intentions of the project and the project design, a minimal amount of vegetation may be removed to accommodate the enhancement. Following the completion of the project, mitigation measures are necessary to counter their removal and restore the disturbed habitat by replanting vegetation (including conifers) and allowing them to mature. This is a long-term process and may take up to 50 years (US Department of Ecology & Department of the Interior).

19) Alternative Impacts: ANIMALS

The addition of a hydroelectric facility on the preexisting dam will likely have minimal impacts on fish and wildlife species throughout the area. However, noise pollution produced from added turbines will negatively affect these species, potentially disturbing their environment. Furthermore, the construction necessary to install the hydroelectric power facility will have a negative effect on riparian zones used by many fish and wildlife species. Such fish and wildlife species that may be affected are critical, endangered and/or threatened species identified by Washington Department of Fish and Wildlife and are known to be living throughout the Cle Elum River basin, including the bull trout, steelhead, gray wolf, grizzly bear, Canadian lynx, northern goshawk, merlin, bald eagle, and the northern spotted owl. As previously stated, mitigation measures are necessary to counter and restore the disturbed habitat by replanting vegetation and allowing them to mature.

20) Alternative Impacts: ENVIRONMENTAL HEALTH

No significant impacts will occur during the construction of hydroelectric addition to the dam. However, in short-term, noise is likely to occur during daytime hours throughout the construction period. Such noise can be created by traffic on public roads, warning devices (alarms) and by construction equipment.

21) Alternative Impacts: LAND & SHORELINE USE

The project is compatible with existing land and shoreline use; therefore neither property acquisition nor mitigation is required.

22) Alternative Impacts: AESTHETICS

Though many specifics of the proposed alternative, such as building dimensions, are currently indeterminate, it is unlikely that a significant impact would follow construction. The aesthetic value of the area was altered over seven decades ago when the 165ft earth-fill dam was completed, thus enhancement of this structure to not only accommodate irrigation needs and satiate flood concerns, but to also generate hydroelectric power is of minor impact to the aesthetic value of the landscape. Furthermore, no views would be interrupted as this feature resides at the base of a U-shaped glacially carved valley. No mitigation efforts were stipulated in the project proposal to maintain the aesthetic value of the area, which is expected due to its marginal impact.

23) Alternative Impacts: RECREATION

The addition of hydroelectric power will have little negative impact on recreation of the Cle Elum River & Lake. Fishing may be slightly impacted if mortality rates of fish increase due to the installation of turbines for hydroelectric power production and decreases in dissolved oxygen levels. This alternative option will likely produce more slack water, possibly adding to the recreational value of the Cle Elum River as more flat water recreation activities will be available along with increased shore lines and beaches.

24) Alternative Impacts: HISTORIC & CULTURAL PRESERVATION

This alternative site will have no negative effects on the historic nature of the area. The dam is already in place and the surrounding land of the dam has no cultural or historical preservations that would be degraded.

25) Alternative Impacts: TRANSPORTATION

According to the US Department of Ecology & Department of the Interior, there is an existing access road (Forest Road 4330) that runs along the eastside of Cle Elum Reservoir continuing north to Tucquala Lake; therefore the proposal will not likely require further construction for transportation purposes. Regional and local access to Cle Elum Reservoir and the upper Cle Elum River is available via Salmon La Sac Road, which branches off of SR-903. This is a two lane roadway extending northwest from the town of Cle Elum to Forest Road 4330. Access to the left abutment of the dam is also provided by SR-903 and County Road 25010 (Cle Elum Lake Dam Road.) Access to the right abutment of the dam is from Bull Frog Road, which is a Kittitas County Road.

26) Alternative Impacts: UTILITIES

Additional transmission lines will be required to relay electricity to local utilities. Electric power within Kittitas County is provided by Kittitas County PUD and Puget Sound Energy.

CONCLUSIONS

After extensive review of the aforementioned elements of the environment, the impacts both the proposal and the alternative are likely to cause, and the severity and relevance of those adverse effects, we conclude that the alternative proposal presents a more environmentally sound and productive solution for the expressed purpose of hydroelectric power generation. For a myriad of reasons, the environmental costs strongly outweigh the economic benefits when considering the potential impacts to Ruth Creek, whereas the Cle Elum Hydroelectric Project presents a far less significant impact to the surrounding environment.

Assessment of the project vicinity for the proposed hydroelectric project on Ruth Creek revealed many environmental concerns that were difficult to overlook in exchange for 2.5MW of power. The local soils are typically sandy loams which can exhibit firm structure and strength when accompanied by extensive root systems, but due to the need to remove native species for construction purposes, the soil may be destabilized and may increase susceptibility for sloughing. Risk of erosion was also high, which could lead to siltation and sedimentation of Ruth Creek and the North Fork Nooksack River; this can trigger a domino effect, increasing water turbidity, decreasing light needed for aquatic species and lowering dissolved oxygen levels. Though only one of the three fish species known to inhabit this tributary is native to the area, the cutthroat trout, preserving these existing populations may become more difficult if the proposed actions were to take place. Furthermore, the entirety of the project area resides within Mt. Baker-Snoqualmie National Forest, and is home to historic tree stands dating back to 1301 (MBSNF, 2011). Although it was indeterminate if any local plant species were endangered or at risk, this drainage has experienced relatively minimal forestry practices and is instead popular for its recreational activities. The proximity of the Goat Mountain Trail and Mount Bake Wilderness further reinforces this point, along with noted fly fishing and white water rafting/kayaking in Ruth Creek. Overall, the likely impacts from the proposed action will have a notable effect on this minimally impacted landscape.

In contrast to the Ruth Creek proposal, the alternative proposal to develop a hydroelectric facility on the existing 165ft earth-fill Cle Elum Dam presented few potential environmental impacts of notable concern. The unifying reasoning for this evaluation was the pre-existence of substantial human impact on the landscape, causing little concern for further degradation from the proposed hydroelectric facility. We do not mean to imply that severe impacts were predicted and overlooked due to the project location, but that identified adverse effects were minimal and further lessened due to the current condition of the proposed site. Though Okanogan-Wenatchee National Forest is nearby, the project area sits at the base of a built up, man-made reservoir. Conversely, the Ruth Creek proposal sits in a largely untouched sub-alpine landscape. Another advantage to the

alternative proposal is the continued and uninterrupted use of the current reservoir functions of mitigating floods, providing irrigation and allowing recreational uses. Though the added facilities would impact an estimated 6 acres of altered land, they present far fewer and less severe potential environmental impacts than the Ruth Creek proposal.

As studies have shown the detrimental effects on riparian function following dam construction, we highly recommend the alternative proposal to develop and enhance the existing Cle Elum Dam to accommodate hydroelectric power generation instead of impeding the natural flow and scenic condition of Ruth Creek. This sub-alpine tributary has seen little impact from anthropogenic influences, as opposed to the alternative proposal which has been an altered landscape for over seven decades. After a thorough evaluation and prioritization of all the elements of the environment stipulated by both NEPA & SEPA, consideration of the projected hydroelectric output of each proposal, and assessment of all other relevant information, we conclude that the alternative proposal presents little to no significant environmental impacts and is, therefore, our recommendation.

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APPENDICES

I. Description of Ruth Creek Hydroelectric Project Features

Diversion Weir	8ft x 100ft concrete structure to permit passage of excess stream flow	Maintain normal water level of 2,670ft msl.
Intake Structure	15ft x 12ft x 45ft long Reinforced concrete structure	Located on right bank adjacent to weir where water will pass through a trash rack and fish screen before entering a penstock
Penstock	8.000ft long x 42" diameter steel structure	Sections both buried and above ground; water flow diverted from intake structure
Powerhouse	40ft x 60ft concrete structure	Housing turbine/generators, switch gear, control system and auxiliary equipment
Tailrace	Initial 20ft –6ft x 6ft buried concrete culvert; Final 20ft-12ft wide rip rap lined open channel blending with creek bank	The 40ft long tailrace will return water from the turbine discharge to the creek
Switchyard	3 MVA 4.16/55kv three phase step-up transformer	Located 65ft from powerhouse will contain high side and low side disconnects and will be surrounded by containment dike and security fence.
Access Roads	Existing road: FS Develop Rd. 32	Two new roads; Upper-400ft for intake access Lower-90ft for powerhouse/switchyard access
Transmission Lines	2.2 miles Voltage of 55kVA	Approximation subject to permitting process

There are no plans for future additions, expansions or further activity related to or connected with this proposal. There are no pending applications for approval of projects affecting the property covered by this proposal.

II. Vegetation Native to Ruth Creek Area

*Species known to be living in and around Ruth Creek within the North Fork Nooksack River Basin, Whatcom County, WA (WNPS)

Scientific Name	Common Name	Plant Family
Abies amabilis	Pacific silver fir	*Pinaceae*
Abies grandis	Grand fir	*Pinaceae*
Agrostis scabra	Tickle-grass	*Poaceae*
Alnus rubra	Red alder	*Betulaceae*
Aster modestus	Great northern aster	*Asteraceae*
Athyrium filix-femina	Lady fern	*Polypodiaceae*
Barbarea orthoceras	American wintercress	*Brassicaceae*
Blechnum spicant	Deer fern	*Polypodiaceae*
Calamagrostis canadensis	Bluejoint	*Poaceae*
Carex canescens	Silvery sedge	*Cyperaceae*
Carex limosa	Shore sedge	*Cyperaceae*
Carex rostrata	Beaked sedge	*Cyperaceae*
Carex sitchensis	Sitka sedge	*Cyperaceae*
Cicuta douglasii	Water-hemlock	*Apiaceae*
Cornus canadensis	Bunchberry	*Cornaceae*
*Daucus carota**	Queen Anne's lace	*Apiaceae*
Dicentra formosa	Bleeding heart	*Fumariaceae*
Drosera rotundifolia	Round-leaf sundew	*Droseraceae*
Epilobium watsonii	Watson's willow-herb	*Onagraceae*
Equisetum fluviatale	Swamp horsetail	*Equisetaceae*
Eriophorum chamissonis	Chamisso's cottonghrass	*Cyperaceae*
Galium trifidum	Small bedstraw	*Rubiaceae*
Galium triflorum	Fragrant bedstraw	*Rubiaceae*
Geum macrophyllum	Large-leaved avens	*Rosaceae*
Gymnocarpium dryopteris	Oak fern	*Polypodiaceae*
Habenaria dilatata	White bog-orchid	*Orchidaceae*
Heracleum lanatum	Cow parsnip	*Apiaceae*
Juncus effusus	Soft rush	*Juncaceae*
Juncus ensifolius	Daggerleaf rush	*Juncaceae*
Juncus sp.	Rush	*Juncaceae*
Kalmia microphylla	Alpine laurel	*Ericaceae*
Ledum groendlandicum	Labrador tea	*Ericaceae*
Linnaea borealis	Twinflower	*Caprifoliaceae*
Lonicera involucrata	Twinberry	*Caprifoliaceae*
Luzula sp.	Woodrush	*Juncaceae*
Lysichiton americanum	Skunk cabbage	*Araceae*
Maianthemum dilatatum	False lily-of-the-valley	*Liliaceae*
Menyanthes trifoliata	Buckbean	*Menyanthaceae*
Montia siberica	Candyflower	*Portulacaceae*
Myosotis laxa	Small-flowered forget-me-not	*Boraginaceae*
Oenanthe sarmentosa	Water parsley	*Apiaceae*
Osmorhiza chilensis	Mountain sweet-cicely	*Apiaceae*

Polystichum munitum	Sword fern	*Polypodiaceae*
Potentilla palustris	Marsh cinquefoil	*Rosaceae*
Pyrus fusca	Crabapple	*Rosaceae*
Ribes bracteosum	Stink currant	*Grossulariaceae*
Rubus spectabilus	Salmonberry	*Rosaceae*
Rumex occidentalis	Western dock	*Polygonaceae*
Salix sitchensis	Sitka willow	*Salicaceae*
Sambucus racemosa	Red elderberry	*Caprifoliaceae*
Scirpus microcarpus	Small-flowered bulrush	*Cyperaceae*
Spiraea douglasii	Hardhack	*Rosaceae*
Spiranthes romanzoffiana	Hooded ladies-tresses	*Orchidaceae*
Stellaria calycantha	Northern starwort	*Caryophyllaceae*
Thuja plicata	Western red cedar	*Cupressaceae*
Tofieldia glutinosa	Bog lily	*Liliaceae*
Trientalis arctica	Northern star-flower	*Primulaceae*
Trientalis latifolia	Broadleaved starflower	*Primulaceae*
Tsuga heterophylla	Western hemlock	*Pinaceae*
Vaccinium oxycoccus	Wild cranberry	*Ericaceae*
Veronica americana	American brooklime	*Scrophulariaceae*
Viburnum edule	Highbush cranberry	*Caprifoliaceae*
Viola palustris	Marsh violet	*Violaceae*

III. Rare Vegetation Native to Whatcom County

*Rare plants known to be living in Whatcom County, WA. (WNHP)		
Scientific Name	**Common Name**	**State Status**
Agoseris elata	Tall agoseris	Sensitive
Anemone patens var. multifida	Pasqueflower	Threatened
Botrychium ascendens	Triangular-lobed moonwort	Sensitive
Botrychium pedunculosum	Stalked moonwort	Sensitive
Carex comosa	Bristly sedge	Sensitive
Carex flava	Yellow sedge	Sensitive
Carex heteroneura var. epapillosa	Smooth-fruit sedge	Sensitive
Carex macrochaeta	Large-awn sedge	Threatened
Carex magellanica ssp. irrigua	Poor sedge	Sensitive
Carex pauciflora	Few-flowered sedge	Sensitive
Carex pluriflora	Several-flowered sedge	Sensitive
Carex scirpoidea ssp. scirpoidea	Canadian single-spike sedge	Sensitive
Carex stylosa	Long-styled sedge	Sensitive
Chaenactis thompsonii	Thompson's chaenactis	Sensitive

Cicuta bulbifera	Bulb-bearing water-hemlock	Sensitive
Cimicifuga elata var. elata	Tall bugbane	Sensitive
Draba aurea	Golden draba	Sensitive
Eurybia merita	Arctic aster	Sensitive
Eutrochium maculatum var. bruneri	Spotted Joe-Pye weed	Possibly Extinct
Fritillaria camschatcensis	Black lily	Sensitive
Gentiana glauca	Glaucous gentian	Sensitive
Hypericum majus	Canadian St. John's-wort	Sensitive
Lobelia dortmanna	Water lobelia	Threatened
Lycopodiella inundata	Bog clubmoss	Sensitive
Lycopodium dendroideum	Treelike clubmoss	Sensitive
Nymphaea tetragona	Pygmy water-lily	Possibly Extinct
Orthocarpus bracteosus	Rosy owl-clover	Endangered
Oxytropis campestris var. gracilis	Slender crazyweed	Sensitive
Platanthera obtusata	Small northern bog-orchid	Sensitive
Platanthera sparsiflora	Canyon bog-orchid	Threatened
Rotala ramosior	Lowland toothcup	Threatened
Salix sessilifolia	Soft-leaved willow	Sensitive
Saxifraga rivularis	Pygmy saxifrage	Sensitive
Subularia aquatica var. americana	Water awlwort	Potential Concern
Utricularia minor	Lesser bladderwort	Potential Concern

*All native plant species are considered threatened in Washington due to our rapid growth of population and the demand for development it conquers our environment.
*State status of rare plant species in Washington State is determined by the Washington Natural Heritage Program. Factors considered in the study were abundance, occurrence patterns, vulnerabilities, threats, existing protection & taxonomic distinctness.
Endangered- in danger of becoming extinct or extirpated from Washington.
Threatened- likely to become endangered in Washington.
Sensitive- vulnerable or declining and could become endangered or threatened in Washington state.
Possibly Extinct- or only removed from Washington.
Potential Concern- needs more field work and taxonomic review to assign ranking.

IV. Fish and Wildlife Native to Ruth Creek Area

*Fish and wildlife species known to be living in and around the North Fork Nooksack River Basin, Whatcom County, WA. (WDFW)

Scientific Name	Common Name	Family Name
Salmonid Species		
Oncoryhnchus keta	Chum Salmon	*Salmonidae*
Oncoryhnchus gorbuscha	Pink Salmon	*Salmonidae*
Oncoryhnchus kisutch	Coho Salmon	*Salmonidae*
Oncoryhnchus tshawytscha	Chinook Salmon	*Salmonidae*
Oncoryhnchus nerka	Sockeye Salmon (and kokanee)	*Salmonidae*
Oncoryhnchus Mykiss	Steelhead/ Rainbow Trout	*Salmonidae*
Oncoryhnchus clarki clarki	Coastal Cutthroat Trout	*Salmonidae*
Salvelinus confluentus	Bull Trout	*Salmonidae*
Salvelinus malma	Dolly Varden Trout	*Salmonidae*
Salvelinus fontinalis	Brook Trout	*Salmonidae*
Prosopium williamsoni	Mountain Whitefish	*Salmonidae*
Thymallus arcticus	Arctic Grayling	*Salmonidae*
Salmo salar	Atlantic Salmon	*Salmonidae*
Salmo trutta	Brown Trout	*Salmonidae*
Terrestrial Species		
Canis lupis	Gray Wolf	*Canidae*
Vulpes vulpes	Cascade Red Fox	*Canidae*
Ursus arctos	Grizzly Bear	*Ursidae*
Brachyamphus marmoratus	Marbled Murrelet	*Alcidae*
Strix occidentalis	Spotted Owl	*Strigidae*
Gulo gulo luteus	North American Wolverine	*Mustelidae*
Coccyzus americanus	Yellow-Billed Cuckoo	*Cuculidae*
Haliaeetus leucocephalus	Bald Eagle	*Accipitridae*
Myotis evotis	Long-Eared Myotis	*Vespertilionidae*
Myotis volans	Long-Legged Myotis	*Vespertilionidae*
Accipiter gentilis	Northern Goshawk	*Accipitridae*
Contopus cooperi	Olive-sided Flycatcher	*Tyrannidae*
Falco columbarius	Merlin	*Falconidae*
Corynorhinus townsendii townsendii	Pacific Townsend's Big-Eared Bat	*Vespertilionidae*
Falco peregrinus	Peregrine Falcon	*Falconidae*
Ascaphus truei	Tailed Frog	*Ascaphidae*
Rana cascadae	Cascade Frog	*Ranidae*
Rana luteiventris	Columbia Spotted Frog	*Ranidae*
Anaxyrus boreas	Western Toad	*Bufonidae*
Sciurus griseus griseus	Western Gray Squirrel	*Scuiridae*
Martes pennanti	Pacific Fisher	*Mustelidae*

Euphydyras phaeton	Checkerspot Butterfly	*Nymphalidae*
Centrocercus urophasianus	Sage Grouse	*Tetraonidae*
Rangifer tarandus	Mountain Caribou	*Cervidae*
Odocoileus hemionus columbianus	Black-tailed Deer	*Cervidae*
Alces alces	Moose	*Cervidae*
Cervus elaphus	Elk	*Cervidae*
Oreamnos americanus	Mountain Goat	*Bovidae*
Puma concolor	Cougar	*Felidae*
Lynx canadensis	Canada Lynx	*Felidae*
Speyeria zerene hippolyta	Oregon Silverspot Butterfly	*Nymphalidae*

V. Rare Fish and Wildlife Native to Ruth Creek Area

*Fish and wildlife species known to be living in and the North Fork Nooksack River Basin, Whatcom County, WA. (WDFW)

Scientific Name	Common Name	State Status
Salmonid Species		
Oncoryhnchus keta	Chum Salmon	Potential Concern
Oncoryhnchus kisutch	Coho Salmon	Potential Concern
Oncoryhnchus tshawytscha	Chinook Salmon	Threatened
Oncoryhnchus nerka	Sockeye Salmon (and kokanee)	Potential Concern
Oncoryhnchus Mykiss	Steelhead/ Rainbow Trout	Potential Concern
Salvelinus confluentus	Bull Trout	Threatened
Salvelinus malma	Dolly Varden Trout	Potential Concern
Terrestrial Species		
Canis lupis	Gray Wolf	Endangered
Vulpes vulpes	Cascade Red Fox	Potential Concern
Ursus arctos	Grizzly Bear	Endangered
Brachyamphus marmoratus	Marbled Murrelet	Threatened
Strix occidentalis	Spotted Owl	Endangered
Gulo gulo luteus	North American Wolverine	Potential Concern
Coccyzus americanus	Yellow-Billed Cuckoo	Potential Concern
Haliaeetus leucocephalus	Bald Eagle	Sensitive
Accipiter gentilis	Northern Goshawk	Potential Concern
Corynorhinus townsendii townsendii	Pacific Townsend's Big-Eared Bat	Potential Concern
Rana luteiventris	Columbia Spotted Frog	Potential Concern
Anaxyrus boreas	Western Toad	Potential Concern
Falco peregrinus	Peregrine Falcon	Sensitive
Martes pennanti	Pacific Fisher	Endangered
Falco columbarius	Merlin	Threatened
Rangifer tarandus	Mountain Caribou	Endangered
Speyeria zerene hippolyta	Oregon Silverspot Butterfly	Threatened
Lynx canadensis	Canada Lynx	Threatened

Factors considered in the study were abundance, occurrence patterns, vulnerabilities, threats, existing protection and taxonomic distinctness.
Endangered- in danger of becoming extinct or extirpated from Washington.
Threatened- likely to become endangered in Washington.
Sensitive- vulnerable or declining and could become endangered or threatened in Washington state.
Possibly Extinct- or only removed from Washington.
Potential Concern- needs more field work and taxonomic review to assign ranking.

VI. Diagrams of Small-Scale, Run-of-the-River Hydroelectric Systems (3)

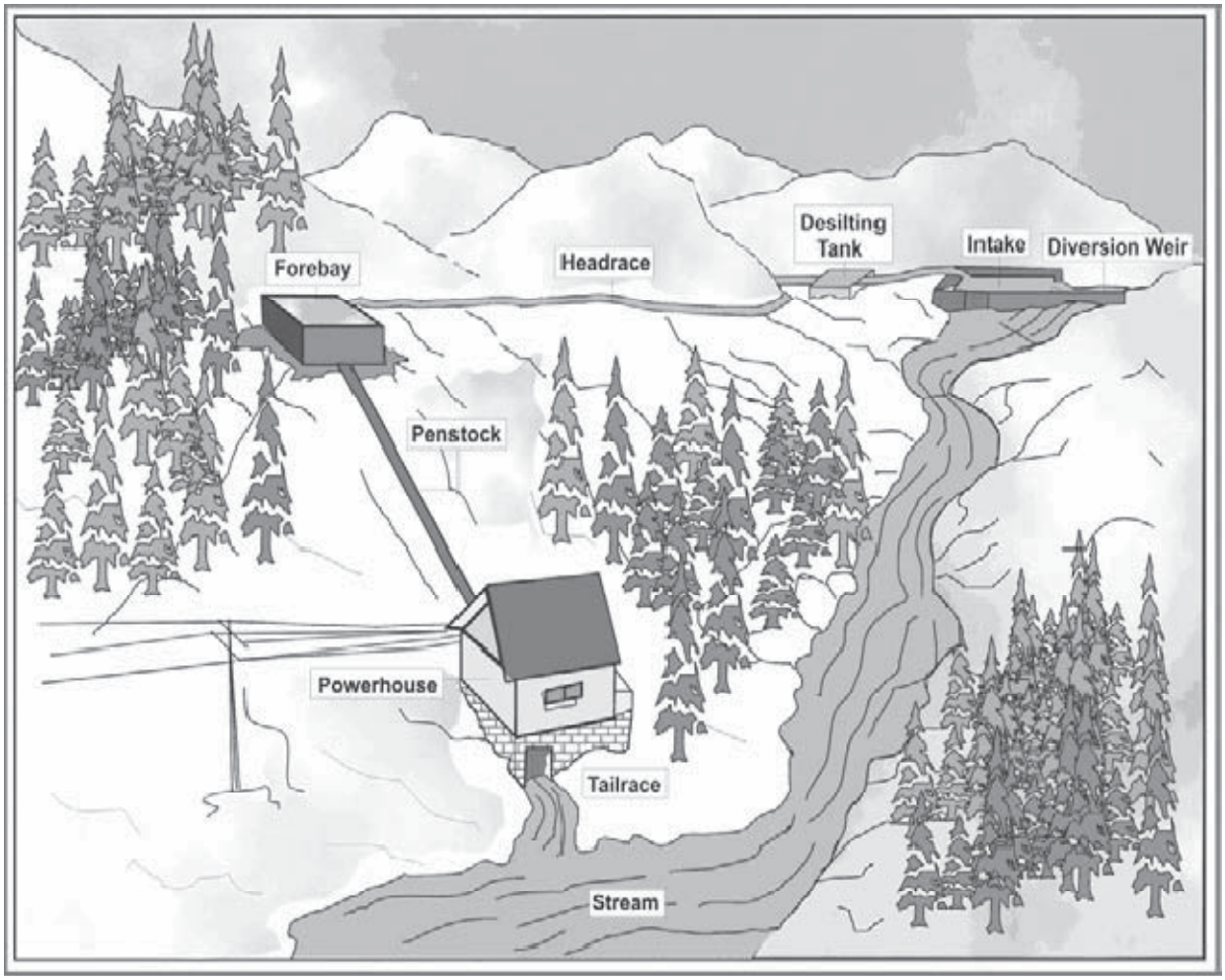


Image courtesy of: Singal S.K. 2009. Planning and Implementation of Small Hydropower (SHP) Projects. Hydro Nepal 5:21-25.

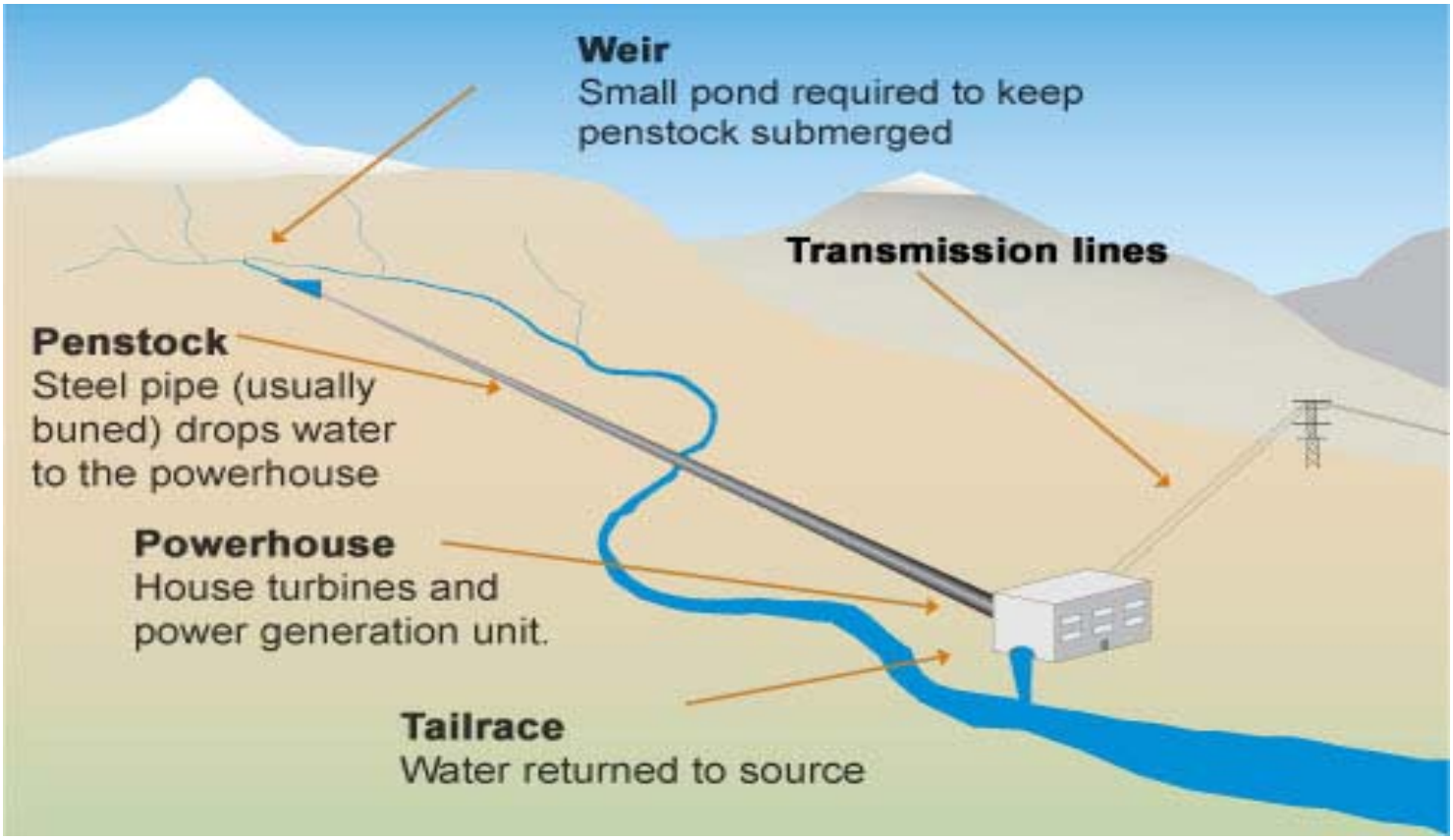


Image courtesy of Hydroelectric Energy: http://hydroelectric-energy.blogspot.com/2010/12/run-of-river-method-hydroelectricity.html

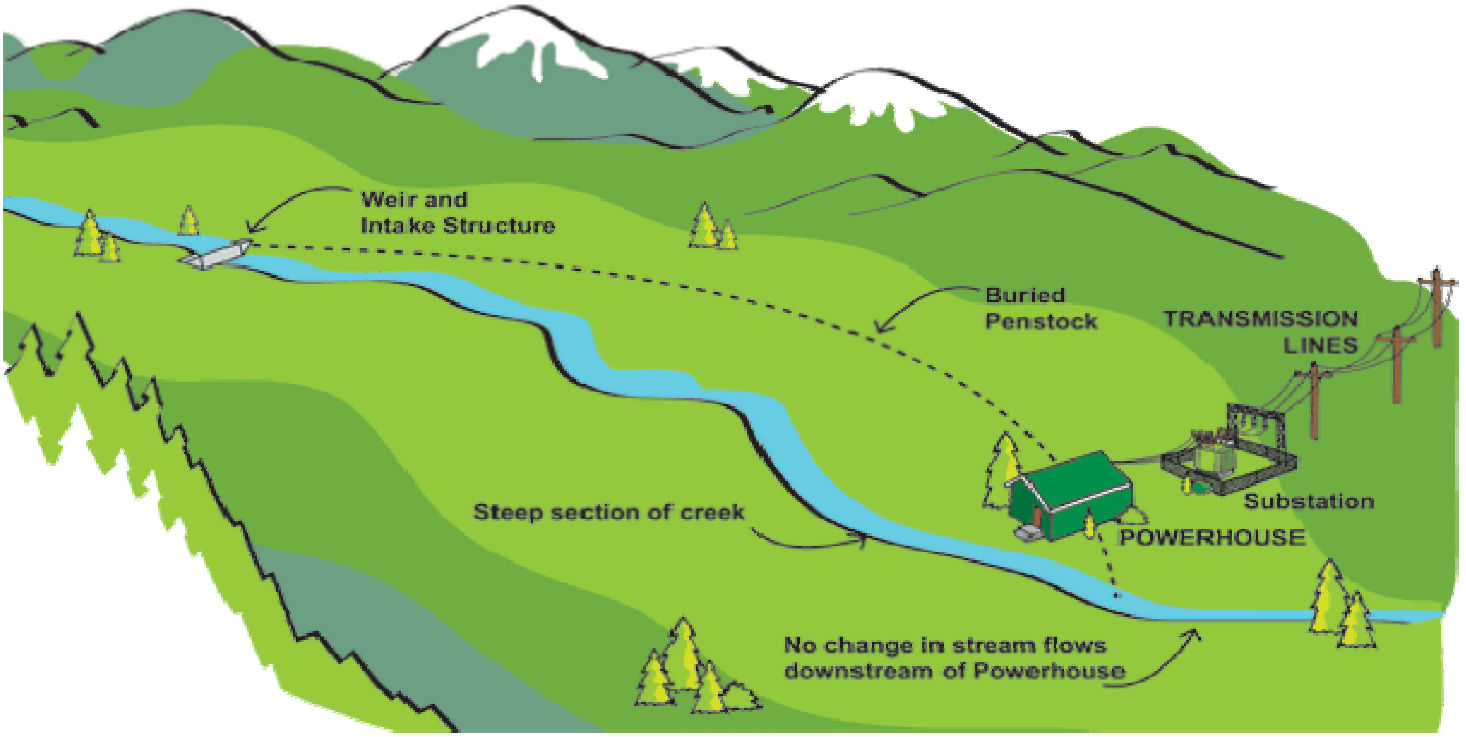


Image courtesy of Hydromax: http://www.hydromaxenergy.com/Green+Power/Run-of-River+Hydro+Power/Run-of-River+Hydro+Power.htm

VII. Preliminary Permit Issuance

UNITED STATES OF AMERICA 134 FERC 62,087

FEDERAL ENERGY REGULATORY COMMISSION

Clean River Power 12, LLC Project No. 13866-000

ORDER ISSUING PRELIMINARY PERMIT

AND GRANTING PRIORITY TO FILE LICENSE APPLICATION

(January 31, 2011)

1. Clean River Power 12, LLC filed an application, pursuant to section 4(f) of the Federal Power Act (FPA),**1** to study the feasibility of the proposed Ruth Creek Hydroelectric Project (project) to be located on Ruth Creek in the vicinity of Glacier, in Whatcom County, Washington, on lands owned by the U.S. Forest Service.

2. The proposed project would consist of the following: (1) a 8-foot-high, 100-footlong reinforced concrete diversion weir on Ruth Creek; (2) a 15-foot-wide, 45-foot-long, 12-foot-high reinforced concrete intake structure on the weir with a trash rack, fish screen, and closure gate; (3) an 8,000-foot-long, 42-inch-diameter steel buried and aboveground penstock from the intake structure to the powerhouse; (4) a 60-foot by 40-foot reinforced concrete powerhouse containing one horizontal impulse turbine with a capacity of 2.5 megawatts; (5) a 4.16/55 kilovolt (kV) three stage step up transformer; (6) an approximately 2.2-mile-long, 55 kV transmission line which will tie into an undetermined interconnection; and (7) appurtenant facilities. The estimated annual generation of the Ruth Creek project would be 10 gigawatt-hours.

I. Background

3. The Commission issued a public notice for the project on November 16, 2010. A timely motion to intervene was filed by the U.S. Forest Service. Additionally, timely motions to intervene and comments were filed by American Whitewater, American Rivers, North Cascades Conservation Council, Alpine Lakes Protection Society, Conservation Northwest, Pilchuck Audubon Society, North Cascades Audubon Society, Washington Wilderness Coalition, Sierra Club - Cascade Chapter, and The Mountaineers (American Whitewater et al.). Department of the Interior filed a letter on January 13, 2011, offering no comments. Comments were also filed by Christopher, Andy Basabe, and Peg Larson.

II. Discussion

1 16 U.S.C. § 797(f) (2006).

Project No. P-13866 - 2 -

4. Section 4(f) of the FPA authorizes the Commission to issue preliminary permits for the purpose of enabling prospective applicants for a hydropower license to secure the data and perform the acts required by section 9 of the FPA,**2** which in turn sets forth the material that must accompany an application for license. The purpose of a preliminary permit is to preserve the right of the permit holder to have the first priority in applying for a license for the project that is being studied.**3** Because a permit is issued only to allow the permit holder to investigate the feasibility of a project while the permittee conducts investigations and secures necessary data to determine the feasibility of the proposed project and to prepare a license application, it grants no land-disturbing or other property rights.**4**

5. Some of the comments filed, including Andy Basabe's comment that the project may affect the North Fork Nooksack Research Natural Area, expressed concern that project construction and operation may adversely affect fish and wildlife, aesthetic, recreational interest, and natural resources of Ruth Creek. As noted, a preliminary permit does not authorize a permittee to undertake any construction. Furthermore, the purpose of a preliminary permit is to study the feasibility of the project, including studying potential impacts. The issues raised in the comments are premature at the permit stage, but can properly be addressed in the licensing process.

6. During the course of the permit, the Commission expects that the permittee will carry out prefiling consultation and study development leading to the possible development of a license application. The prefiling process begins with preparation of a Notice of Intent (NOI) and Pre-Application Document (PAD) pursuant to sections 5.5

2 16 U.S.C. § 802 (2006).

3 *See, e.g., Mt. Hope Waterpower Project LLP*, 116 FERC ¶ 61,232 at P 4 (2006) ("The purpose of a preliminary permit is to encourage hydroelectric development by affording its holder priority of application (i.e., guaranteed first-to-file status) with respect to the filing of development applications for the affected site.").

4 Issuance of this preliminary permit is thus not a major federal action significantly affecting the quality of the human environment. A permit holder can only enter lands it does not own with the permission of the landholder, and is required to obtain whatever environmental permits federal, state, and local authorities may require before conducting any studies. *See, e.g., Three Mile Falls Hydro, LLC*, 102 FERC ¶ 61,301 at P 6 (2003); *see also Town of Summersville, W.Va. v. FERC*, 780 F.2d 1034 (D.C. Cir. 1986) (discussing the nature of preliminary permits).

Project No. P-13866 - 3 -

and 5.6 of the Commission's regulations.**5** The permittee must use the Integrated Licensing Process unless the Commission grants a request to use an alternative process (Alternative or Traditional Licensing Process). Such a request must accompany the NOI and PAD and set forth specific information justifying the request.**6** Should the permittee file a development application, notice of the application will be published, and interested persons and agencies will have an opportunity to intervene and to present their views concerning the project and the effects of its construction and operation.

7. A preliminary permit is not transferable. The named permittee is the only party entitled to the priority of the application for license afforded by this preliminary permit. In order to invoke permit-based priority in any subsequent licensing competition, the named permittee must file an application for license as the sole applicant, thereby evidencing its intent to be the sole licensee and to hold all proprietary rights necessary to construct, operate, and maintain the proposed project. Should any other parties intend to hold during the term of any license issued any of these proprietary rights necessary for project purposes, they must be included as joint applicants in any application for license filed. In such an instance, where parties other than the permittee are added as joint applicants for license, the joint application will not be eligible for any permit-based priority.**7**

The Director orders:

(A) A preliminary permit is issued for the Ruth Creek Hydroelectric Project No. 13866 to Clean River Power 12, LLC for a period effective the first day of the month in which this permit is issued, and ending either 36 months from the effective date or on the date that a development application submitted by the permittee has been accepted for filing, whichever occurs first.

(B) This preliminary permit is subject to the terms and conditions of Part I of the

Federal Power Act and related regulations. The permit is also subject to Articles 1 through 4, set forth in the attached standard form P-1.

5 18 C.F.R. §§ 5.5 and 5.6 (2010).

6 *See* 18 C.F.R. § 5.3 (2010).

7 *See City of Fayetteville*, 16 FERC ¶ 61,209 (1981).

Project No. P-13866 - 4 -

(C) This order is issued under authority delegated to the Director and constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days from the date of issuance of this order, pursuant to 18 C.F.R. § 385.713.

Jennifer Hill, Chief
Northwest Branch
Division of Hydropower Licensing

Project No. P-13866 - 5 -

Form P-1

FEDERAL ENERGY REGULATORY COMMISSION

TERMS AND CONDITIONS OF

PRELIMINARY PERMIT

Article 1. The purpose of the permit is to maintain priority of application for a license during the term of the permit while the permittee conducts investigations and secures data necessary to determine the feasibility of the proposed project and, if the project is found to be feasible, prepares an acceptable application for license. In the course of whatever field studies the permittee undertakes, the permittee shall at all times exercise appropriate measures to prevent irreparable damage to the environment of the proposed project. This permit does not authorize the permittee to conduct any grounddisturbing activities or grant a right of entry onto any lands. The permittee must obtain any necessary authorizations and comply with any applicable laws and regulations to conduct any field studies.

Article 2. The permit is not transferable and may, after notice and opportunity for hearing, be canceled by order of the Commission upon failure of the permittee to prosecute diligently the activities for which a permit is issued, or for any other good cause shown.

Article 3. The priority granted under the permit shall be lost if the permit is canceled pursuant to Article 2 of this permit, or if the permittee fails, on or before the expiration date of the permit, to file with the Commission an application for license for the proposed project in conformity with the Commission's rules and regulations then in effect.

Article 4. At the close of each six-month period from the effective date of this permit, the permittee shall file a progress report electronically via the Internet; and shall serve a copy on the intervenors in this proceeding. To paper-file instead, mail four copies of the progress report to the Secretary, Federal Energy Regulatory Commission, 888 First Street, N.E., Washington, D.C. 20426. The report shall describe, for that report period, the nature and timing of what the permittee has done under the pre-filing requirements of 18 C.F.R. sections 4.38 and 5.1-5.31 and other applicable regulations; and, where studies require access to and use of land not owned by the permittee, the status of the permittee's efforts to obtain permission to access and use the land.

20110131-3033 FERC PDF (Unofficial) 01/31/2011 P-13866-000Order.DOC

VIII. The Federal Power Act

THE FEDERAL POWER ACT- Hydropower Licensing and Consideration of Environmental Values- II (Hydropower Licensing)

http://hydroreform.org/policy/fpa

The Federal Power Act (FPA) authorizes the Federal Energy Regulatory Commission (FERC) to issue exemptions or licenses to construct, operate and maintain dams, water conduits, reservoirs, and transmission lines to improve navigation and to develop power from streams and other bodies of water over which it has jurisdiction. 16 U.S.C. § 797(e).

FERC's jurisdiction extends to all hydropower dams not owned by the federal government that either:

1. occupy federal public lands or federal reservations;
2. are located on navigable streams;
3. use surplus water or water power from a federal government dam; or
4. were constructed after August 26, 1935 and are located on a non-navigable stream that affects the interests of interstate or foreign commerce (including providing power to an interstate power grid).

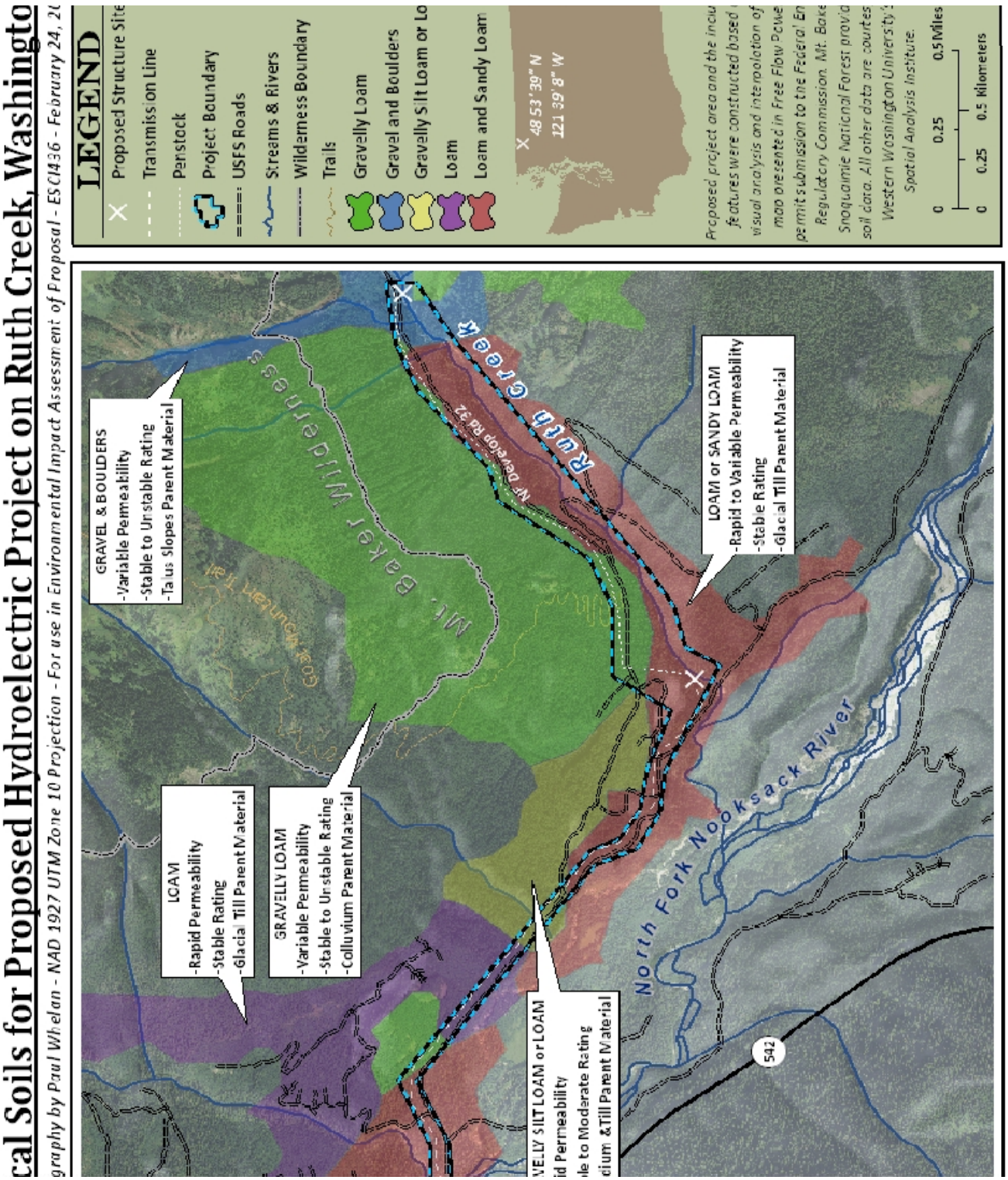
Navigable waters include parts of stream or other bodies over which Congress has jurisdiction to regulate commerce which, either in their natural or improved condition, are suitable for use to transport persons or property in interstate or foreign commerce. According to the Act, hydropower licenses are not to exceed 50 years in length. 16 U.S.C. §§ 797, 798-802.

A. Section 4(e)- Conditions Applying to Projects Located within a Federal Reservation

Under Section 4(e) of the Act, 16 U.S.C § 797(e), FERC must consider environmental requirements for licensing a project within a federal reservation. A federal reservation under the Act is a technical term, defined generally as a national forest, tribal land, military reservations, and other lands and interests in lands reserved for other public purposes. They include any lands and interests in lands acquired and held for any public purposes by the federal government (they do not include national monuments or national parks, where hydropower licensing is prohibited).

There are two substantive requirements for licensing a project within a federal reservation:

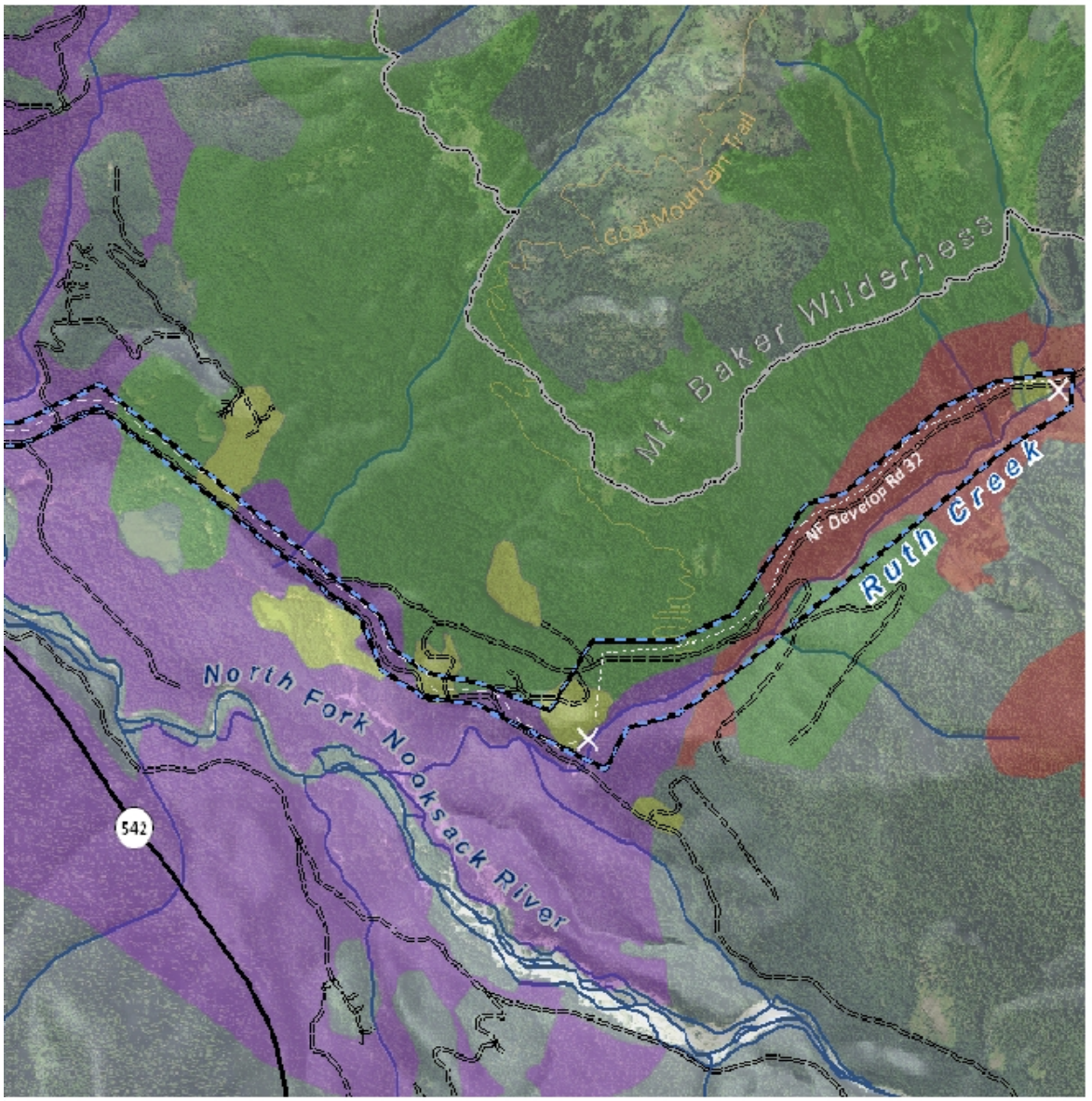
1. FERC must find that the license will not interfere with or be inconsistent with the purposes for which the reservation was created or acquired.
2. A license must be issued on terms that the federal agency responsible for the reservation finds are necessary for the adequate protection and utilization of that reservation. This is not a veto power, and the land managing agency may not prevent FERC from issuing the license. However, the land managing agency's conditions must be included within the FERC license or it cannot be issued.

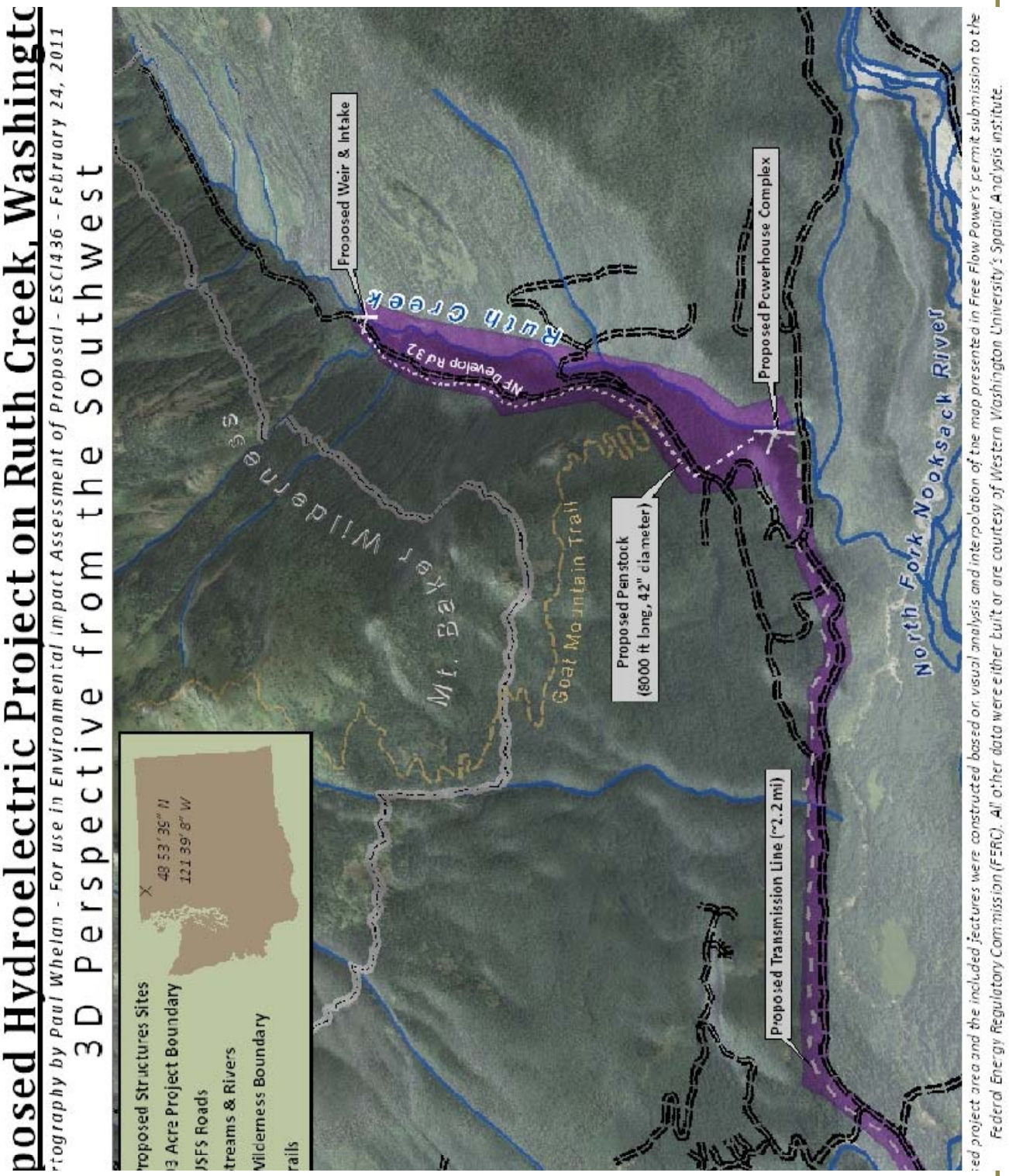


X. Local Tree Stands

l Tree Stand Year for Proposed Hydroelectric Project on Ruth Creek, Washi

aphy by Paul Whelan - NAD 1927 UTM Zone 10 Projection - For use in Environmental Impact Assessment of Proposal - ESCI436 - February



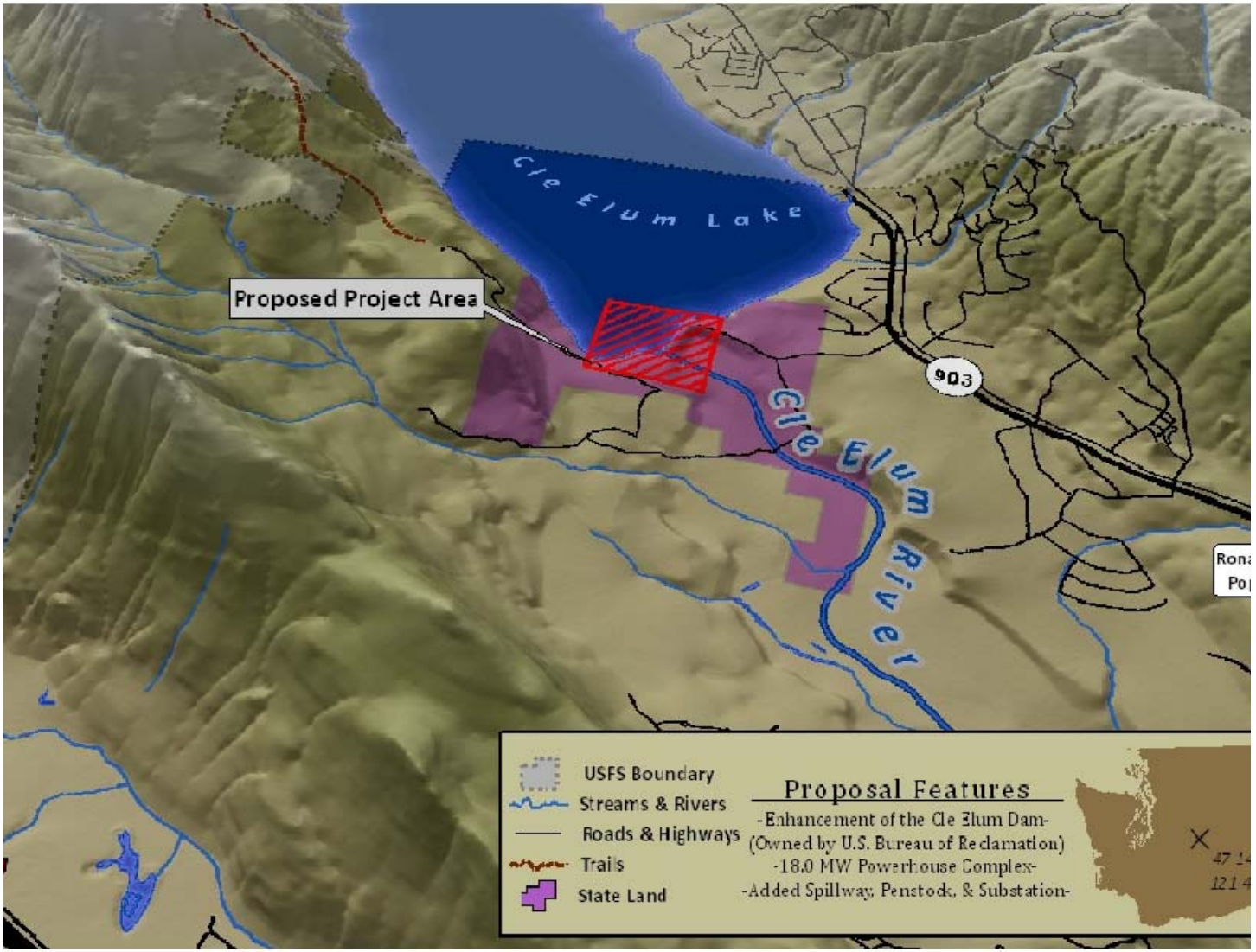


XII. 3D Perspective of Cle Elum Proposal

Alternative Proposal: The Cle Elum Hydroelectric Pro

phy by Paul Whelan - For use in Environmental Impact Assessment of The Ruth Creek Hydroelectric Project - ESCI436 - February

3D Perspective from the Southwest



was determined by visual analysis and interpolation of Free Flow Power's permit submission to the Federal Energy Regulatory Commission (FERC). Kittitas County provided
'chee National Forest provided the USFS boundary and stream data. All other data layers were either built or are courtesy of Western Washington University's Spatial Analy